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Integration of ICT in Teaching Mathematics in Elementary Schools in Tinglayan District, Schools Division of Kalinga

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Abstract

This study investigated the perceptions of elementary teachers toward the integration of Information and Communication Technology (ICT) in Mathematics instruction in Tinglayan District, Schools Division of Kalinga, a geographically isolated and disadvantaged area (GIDA). Recognizing the growing importance of ICT in enhancing teaching and learning, particularly in Mathematics where abstract concepts often challenge learners, the study explored teachers' perceptions, the extent of ICT integration, challenges encountered, and differences in perceptions based on selected profile variables. A descriptive-correlational research design was employed involving 121 elementary teachers from twenty-one public elementary schools in the district. Data were gathered using a structured survey questionnaire adapted from validated instruments and supplemented by informal interviews to provide contextual insights. Statistical tools such as descriptive statistics, t-test, One-Way ANOVA, Kruskal-Wallis H test, Mann-Whitney U test, and Pearson Product Moment Correlation were utilized in analyzing the data.

Findings revealed that ICT resources in the district were moderately sufficient, with notable inadequacies in student computers or tablets, mathematics software and educational applications, and backup power sources. Despite these limitations, teachers generally expressed positive perceptions toward ICT integration, recognizing its usefulness, ease of use, and relevance in improving learner engagement and achievement in Mathematics. The extent of ICT integration in instruction was assessed to a great extent. The study further revealed that there were generally no significant differences in teachers' perceptions and extent of ICT integration when grouped according to sex, age, educational attainment, years of teaching experience, and grade level taught, except for the relevance dimension which showed a significant difference based on sex. Major challenges identified by teachers included insufficient ICT training, low student digital literacy, unreliable internet connectivity, and lack of culturally and contextually relevant digital Mathematics resources. Moreover, a significant positive relationship was found between teachers' perceptions of ICT usefulness and the extent of ICT integration in Mathematics instruction.

The study highlights the importance of sustained support systems, continuous capacity-building programs, improved ICT infrastructure, and the development of localized digital learning resources to strengthen ICT integration in geographically isolated schools. The findings provide valuable insights for the Department of Education, school administrators, and future researchers in addressing the digital divide and promoting more effective, inclusive, and technology-enhanced Mathematics education in remote learning environments.

Keywords: ICT integration, Mathematics instruction, teacher perceptions, GIDA schools, elementary education, Kalinga, Philippines

1. Introduction

The integration of Information and Communication Technology (ICT) in education has been a central thrust of the Philippine Department of Education (DepEd) over the past two decades. Aligned with global trends and the Sustainable Development Goals (SDG 4: Quality Education), ICT is recognized as a powerful tool in transforming teaching and learning, promoting learner-centered approaches, and bridging gaps in access to quality education. Various DepEd initiatives such as the DepEd Computerization Program (DCP), the K to 12 Curriculum Guide's emphasis on ICT literacy, and the Digital Rise Program (2016) highlight the agency's commitment to embedding ICT across subject areas, including Mathematics. However, despite these national level policies, studies reveal persistent gaps in implementation due to uneven distribution of resources, inadequate infrastructure, and varied teacher readiness (Cortez, 2019; Bernardo, 2020).

In addition, global and national education reform movements emphasize not only the use of ICT as a tool for instruction but also as a means of fostering digital citizenship, higher order thinking, and 21st-century competencies among learners. This broad, long-term vision underscores that ICT integration is not limited to devices and connectivity but also involves pedagogical innovations, teacher professional development, and system wide support mechanisms. These elements are essential in building a resilient and future ready education system capable of addressing both current and emerging learning needs.

At the regional and provincial levels, the Cordillera Administrative Region (CAR) shares these national challenges but is further burdened by its predominantly mountainous terrain, scattered communities, and connectivity issues. While ICT integration efforts are being pursued in urban centers such as Baguio City and Tabuk City, rural and geographically isolated municipalities in Kalinga continue to struggle with reliable internet access, availability of ICT facilities, and sufficient teacher training (Albis & Delos Santos, 2021). This situation creates a digital divide within the same region, limiting the ability of teachers in disadvantaged areas to maximize ICT in classroom instruction.

Moreover, CAR's unique cultural and geographical characteristics including the presence of indigenous communities, multigrade classrooms, and schools located in far flung sitios make ICT integration even more complex. Teachers must often balance traditional community practices with modern instructional technologies, and many schools depend on local government units (LGUs) or external partners for ICT-related support. These contextual realities highlight the need for tailored strategies that reflect the lived experiences of teachers in remote areas of the region.

The challenge becomes more evident when considering subject-specific integration. Mathematics, often perceived by learners as a difficult and abstract subject, stands to benefit greatly from ICT-based instruction. Tools such as dynamic visualization software, interactive simulations, and online platforms can make mathematical concepts more engaging and comprehensible. Research in various contexts has shown that ICT can enhance learner motivation, improve problem-solving skills, and support differentiated instruction in Mathematics (Tindowen et al., 2019). Yet, without adequate resources and teacher confidence, these benefits remain underutilized, especially in rural schools.

Additionally, Mathematics instruction increasingly relies on digital tools that support computational thinking, formative assessment, and data-driven decision-making components that help learners develop skills aligned with global STEM standards. However, these tools require consistent access, teacher

capacity, and supportive school leadership, elements that often vary significantly between urban and rural school districts.

The case of Tinglayan District in the Schools Division of Kalinga is a compelling example of this challenge. As a geographically isolated and disadvantaged area (GIDA), Tinglayan faces unique barriers: rugged terrain, distance from urban centers, inconsistent electricity and internet services, and limited ICT facilities. Despite these constraints, teachers are mandated to integrate ICT into their instruction, particularly in Mathematics. Within the district's 21 elementary schools, educators continue to strive for quality education while contending with these limitations. The perceptions and readiness of teachers in Tinglayan are therefore critical, as they influence whether ICT is perceived as an empowering tool or as an additional challenge in an already demanding teaching environment.

Furthermore, Tinglayan's socio cultural context characterized by strong community ties, limited technological exposure among learners, and reliance on traditional instruction affects how ICT is received and implemented. Teachers often serve as the primary drivers of innovation, and their willingness to adopt ICT is shaped by access to training, administrative support, and their own confidence in using digital tools. These contextual conditions underscore the importance of understanding how ICT integration is experienced specifically in GIDA districts like Tinglayan, where the digital divide is most visible.

While several studies have examined ICT integration in Philippine schools, most focus on urban or semi-urban contexts where ICT resources are more accessible. There remains a paucity of research that documents the experiences of teachers in remote, indigenous, and GIDA communities such as Tinglayan. Filling this gap is essential for creating realistic, context-sensitive recommendations that can inform policy and practice at both regional and national levels. By exploring teachers' perceptions of ICT integration in Mathematics instruction in Tinglayan, this study seeks to uncover both the strengths and challenges they encounter and to propose strategies tailored to the realities of geographically isolated schools.

By giving voice to teachers in Tinglayan, this study also contributes to broader discussions on educational equity and digital inclusion key priorities in the country's long term educational development agenda. The findings are expected to support the creation of more targeted interventions, capacity building initiatives, and policy adjustments that can help bridge the gap between national ICT goals and on the ground realities in remote school communities.

Conceptual Framework

This study is anchored on the principle that teachers' perceptions strongly shape their instructional practices. Teachers who believe that ICT enhances learning are more likely to use it actively in their classrooms, while those who perceive it as a challenge may integrate it minimally or avoid it altogether. The framework follows this simple paradigm:

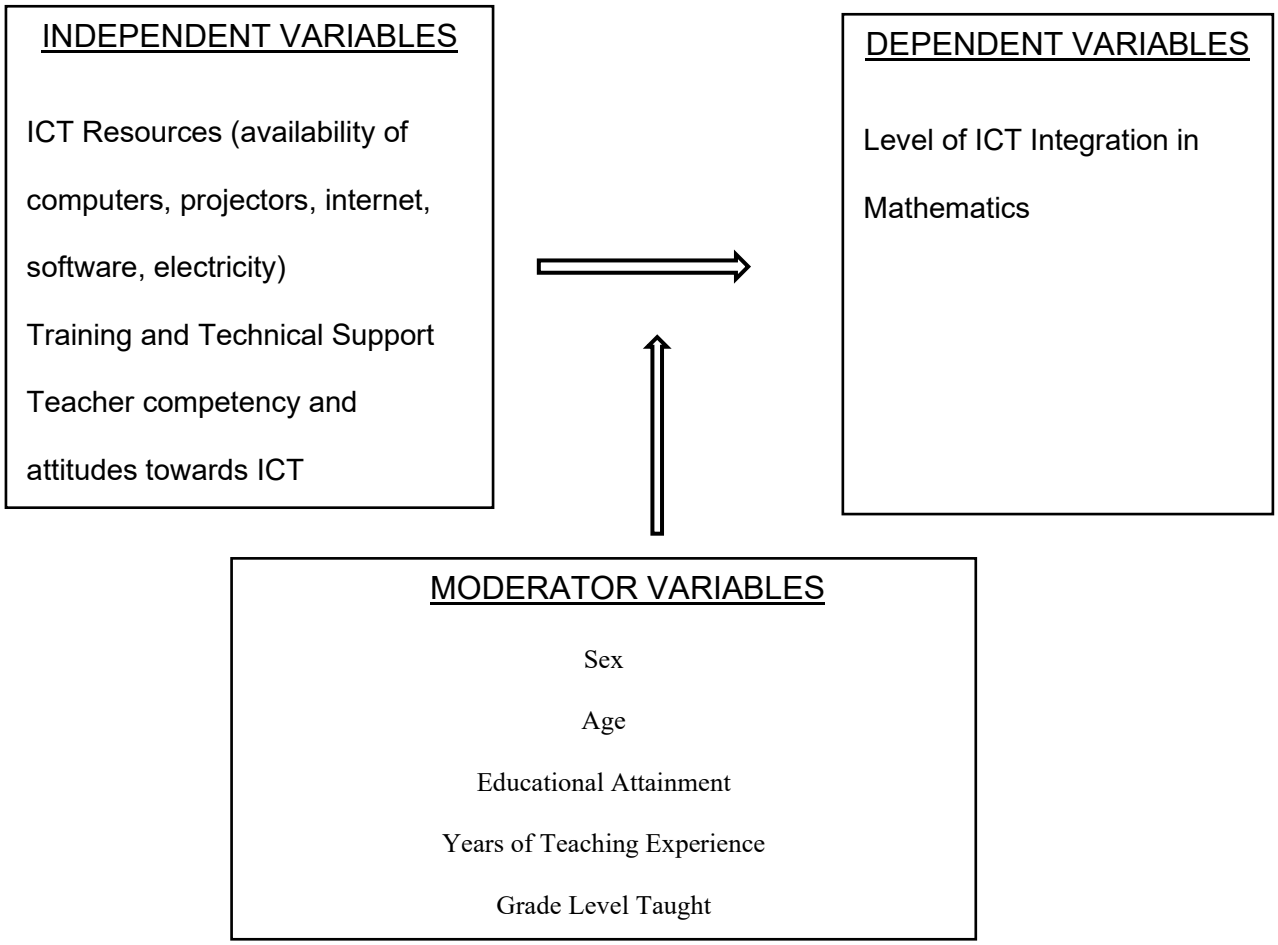

Figure 1. Paradigm of the Study

Statement of the Objectives

This study aims to determine the integration of Information and Communication Technology (ICT) in Mathematics in public elementary schools of Tinglayan Districts, Schools Division of Kalinga. Specifically, it seeks to:

To determine the availability and sufficiency of ICT resources (e.g., computers, projectors, internet, software, electricity) in the elementary schools of Tinglayan District.

To assess the views of teachers regarding the usefulness, ease of use, and relevance of ICT in teaching Mathematics.

There is no significant difference on the views of teachers on the usefulness, ease of use and relevance of ICT in teaching Mathematics when group according to profile variables;

To evaluate the extent of ICT integration in Mathematics instruction, including lesson preparation, classroom delivery, assessment, and enrichment activities.

To identify the challenges and barriers faced by teachers in integrating ICT in Mathematics instruction within the GIDA context of Tinglayan.

Determine the correlation between Teachers' views of ICT use and the extent of ICT integration in Mathematics instruction.

To propose recommendations and strategies for enhancing ICT integration in Mathematics instruction tailored to the realities of geographically isolated schools.

Definition of Terms

Challenges in ICT Integration**.** These refer to the difficulties or barriers encountered by elementary teachers in integrating Information and Communication Technology (ICT) into Mathematics instruction. In this study, challenges include limited ICT facilities, unstable internet connectivity, insufficient training, lack of technical support, and inconsistent electricity supply experienced by teachers in the Tinglayan District.

Extent of ICT Integration**.** This refers to the degree or frequency with which elementary teachers utilize ICT tools in Mathematics instruction. In this study, it includes the use of ICT in lesson preparation, classroom delivery, assessment, and enrichment activities, as measured using a five-point Likert scale.

Geographically Isolated and Disadvantaged Area (GIDA). This refers to communities characterized by physical isolation, difficult terrain, limited transportation, inadequate communication infrastructure, and restricted access to basic services. In this study, it specifically refers to the municipality of Tinglayan in the Schools Division of Kalinga, where schools experience limitations in technological infrastructure that affect ICT integration.

Information and Communication Technology (ICT). This refers to digital technologies used to facilitate the access, processing, storage, and communication of information. In this study, ICT includes tools such as computers, laptops, projectors, internet connectivity, multimedia devices, and educational software used by teachers to support Mathematics instruction.

ICT Resources. These refer to the technological facilities and equipment available in schools that support ICT integration in teaching. In this study, ICT resources include computers, projectors, internet access, software applications, and electricity available in the elementary schools of Tinglayan District.

ICT Integration. This refers to the purposeful incorporation of Information and Communication Technology into the teaching–learning process to enhance instruction and learning outcomes. In this study, ICT integration specifically pertains to the use of digital tools by teachers in teaching Mathematics in the elementary schools of Tinglayan District.

Mathematics Instruction. This refers to the teaching and learning process that involves the planning, delivery, and evaluation of lessons designed to develop learners' mathematical knowledge, skills, and problem-solving abilities. In this study, it refers to the instructional practices of elementary teachers in teaching Mathematics in Tinglayan District.

Teacher Perception of ICT. This refers to the beliefs, attitudes, and opinions of teachers regarding the usefulness, ease of use, and relevance of ICT in teaching Mathematics. In this study, teacher perception is measured using survey indicators that assess teachers' views about the effectiveness of ICT in enhancing Mathematics instruction.

Importance of the Study

This study is significant because it gives voice to teachers in Tinglayan District, whose context as part of a geographically isolated area presents unique challenges to ICT integration. Specifically, the findings are significant to the following entities:

The Teachers. The study offers an opportunity to reflect on their practices, highlight their needs, and share insights on the role of ICT in Mathematics instruction.

For School Heads. The findings provide a basis for designing school-level interventions, support systems, and capacity-building activities tailored to the realities of isolated schools.

For the Schools Division of Kalinga. This study provides evidence-based recommendations to strengthen ICT programs and policies that address gaps in geographically isolated districts.

For Learners. The study indirectly contributes to improving the teaching of Mathematics, making it more meaningful, engaging, and supportive of diverse learning needs.
For Future Researchers. This research serves as a reference point for further studies on ICT integration in challenging contexts such as GIDA schools.

2. REVIEW OF RELATED LITERATURE

This chapter presents a review of related literature and studies that provide the theoretical and empirical foundations of the present research. The literature is drawn from both international and Philippine contexts, focusing on three interconnected themes: (1) global perspectives on ICT integration in education, with particular attention to teacher perceptions, barriers, and infrastructure challenges in rural and disadvantaged settings; (2) ICT integration in Philippine educational contexts, emphasizing studies conducted in elementary, secondary, and remote school environments; and (3) a synthesis of the reviewed works that identifies the research gap which the present study seeks to address. Together, these bodies of literature illuminate the complex interplay between teacher perceptions, resource availability, institutional support, and the actual degree of ICT integration in Mathematics instruction particularly in geographically isolated and disadvantaged areas (GIDA) such as Tinglayan District in Kalinga. The review underscores the relevance and urgency of the present study by situating it within a wider scholarly conversation about equitable access to quality, technology-enhanced education.

Adequacy and Sufficiency of ICT Materials

Dela Cruz and Ramos (2023), teachers in rural Visayas reported that while ICT increased learner motivation, its implementation was inconsistent due to frequent electricity interruptions and limited devices. The researchers emphasized that even when teachers possess positive attitudes toward ICT, external factors such as power reliability directly influence integration effectiveness.
In the study of Mendez and Jacinto (2024), Filipino junior high school teachers identified ICT as beneficial for differentiated instruction, especially for slow and advanced learners. Despite this, limited access to interactive apps and insufficient ICT policies in schools constrained their ability to maximize technology for diverse learners.

Global Perspectives on ICT Integration in Education

The integration of ICT in education has garnered widespread scholarly attention across the globe, with researchers consistently identifying its transformative potential alongside persistent structural barriers. Qasem (2016) found that in-service science teachers expressed both optimism and hesitation in adopting ICT. While teachers demonstrated awareness of ICT's benefits, their confidence in using technology remained low, particularly among older educators. This finding aligns with broader studies suggesting that teacher age and experience significantly influence ICT perception and adoption. Similarly, UNESCO (2021) documented that the COVID-19 pandemic accelerated ICT adoption but simultaneously revealed glaring inequalities between urban and rural schools, with many geographically isolated schools struggling due to weak connectivity and lack of devices. The global report stressed that without substantial infrastructure investments, teachers in isolated areas cannot fully realize ICT's potential in education.
Mensah and Nabie (2021) reinforced these concerns in the Ghanaian context, where teachers viewed ICT positively but reported limited access to ICT tools in rural areas. Their systematic review indicated that while teacher attitudes are generally supportive, the absence of infrastructure continues to prevent ICT from becoming fully embedded in mathematics instruction. UNESCO (2022) further emphasized that ICT in education must be inclusive and equitable, recommending that governments prioritize infrastructure

and teacher training to ensure that learners in geographically isolated schools also benefit from ICT integration. Arhin et al. (2024), also examining the Ghanaian context, found that high school mathematics teachers expressed readiness to use ICT tools but identified significant barriers such as unstable power supply, lack of training, and insufficient school support.

Agarwal et al. (2021) contributed a nuanced perspective by examining online examinations as part of ICT integration, finding that while online assessment systems are efficient and resource-saving, they present challenges such as technical glitches and data synchronization issues. Amrane-Cooper, Baume, and Hatzipanagos (2023) similarly concluded that ICT integration in teaching and assessment is effective only when systems are stable and reliable. Moila (2024) in South Africa found that rural mathematics teachers demonstrated varying levels of ICT competence, with those having greater resource access reporting better student participation. Zamir and Ali (2023) examined pre-service teachers who reported positive ICT perceptions but highlighted time constraints, limited devices, and lack of institutional encouragement as persistent obstacles. The World Bank (2024) reinforced that digital transformation in Philippine education requires not only infrastructure but also policies that support teacher training, equitable access, and contextualized ICT tools for schools in remote areas.

ICT Integration in Philippine Educational Contexts

Within the Philippine setting, research on ICT integration in education reflects both progress and persistent challenges, particularly in rural and disadvantaged areas. Pastor et al. (2022) assessed secondary mathematics teachers in Ilocos Norte in terms of ICT expertise, beliefs, and classroom practices. Results showed that teachers generally held positive beliefs about ICT, with high competence in basic computer tasks. However, actual integration occurred only once or twice a week, suggesting a gap between belief and practice driven by heavy workloads, inadequate facilities, and limited support. Gamit (2023) similarly explored ICT integration in elementary mathematics classrooms in the Philippines, revealing that younger teachers and those in private schools had more positive perceptions compared to older teachers, who continued to face barriers such as poor internet access and lack of training.

Lucas (2023) established an important link between teacher preparedness in ICT and school performance, finding that schools with well-trained and confident ICT-using teachers recorded higher student achievement rates. Arnado and Aviles (2023) examined teachers in Indigenous Peoples (IP) schools in Mindanao, where remote settings and limited infrastructure produced unique challenges. Although teachers expressed moderate confidence in basic technologies, barriers such as weak internet connectivity, lack of devices, and limited technical support remained prominent. Enorme et al. (2023) corroborated these findings through a systematic literature review, underscoring that ICT is most effective when teachers have both resources and the competence to use them.

Bartolome (2023) demonstrated that access to technological gadgets directly impacted teaching effectiveness in San Mateo, Isabela, with teachers who had laptops and projectors delivering more interactive lessons. Basmayor (2024) extended this understanding by finding that elementary teachers showed strong awareness of ICT's importance but that competence varied by age and training background, with younger teachers being more comfortable. Cabansag (2025) discovered in Flora District that elementary teachers were proficient in basic ICT tools such as Microsoft Word and PowerPoint but struggled with advanced integration due to outdated equipment and weak internet connections. Li (2025) contributed theoretical grounding by demonstrating that pre-service teachers' beliefs about ICT strongly predicted their intention to use technology, highlighting the critical role of teacher preparation programs. Marquez-Balda (2025) validated a new scale for measuring teacher attitudes toward ICT integration,

finding that teachers with higher attitude scores were significantly more likely to adopt ICT tools in classroom practices.

According to Amrane-Cooper, Baume, and Hatzipanagos (2023), taking assessments online requires greater planning, robust systems, and longer preparation time than in-person examinations. They concluded that ICT integration in teaching and assessment is effective only when systems are stable and reliable, a lesson that applies to both developed and developing contexts.

According to Yilmaz (2024), Turkish pre-service mathematics teachers showed strong intentions to incorporate ICT in future classrooms, but their actual performance skills were moderate. The study emphasized that technical competence, not just positive attitudes, predicts successful ICT integration.

Abuan and Malinam (2025), teachers in Region II noted that ICT integration improved their classroom management and instructional efficiency. However, their proficiency varied depending on school-based support, availability of ICT coordinators, and access to updated devices. The study recommended strengthened school-level ICT leadership to bridge teacher competency gaps.

Challenges and Barriers in ICT Integration within the GIDA Context

According to Chigona and Manya (2023), South African teachers recognized ICT as essential for promoting learner-centered instruction, but insufficient professional development hindered effective classroom use. Their findings highlighted the need for continuous training programs to help teachers translate ICT awareness into practical pedagogical strategies.

In the study of Estepa and Villanueva (2024), ICT-supported modular learning during the pandemic improved student engagement in mathematics. However, teachers noted that many learners lacked digital literacy skills, requiring additional support. The study concluded that ICT integration must consider both teacher readiness and learner readiness.

According to Adeoye and Bello (2024), Nigerian mathematics teachers experienced challenges such as slow internet connectivity, insufficient technical support, and limited exposure to digital platforms. Nevertheless, teachers believed that ICT could significantly enhance problem-solving and visualization if infrastructure were improved.

In the study of Arhin, Boateng, Akosah, and Gyimah (2024) in Ghana, high school mathematics teachers expressed readiness to use ICT tools but identified significant barriers such as unstable power supply, lack of training, and insufficient school support. Despite these limitations, teachers remained optimistic that ICT could improve student learning if systemic challenges were addressed.

Synthesis and Research Gap

The foregoing review of literature and studies reveals a consistent pattern: teachers across diverse contexts generally hold positive perceptions of ICT in education, yet actual integration is constrained by infrastructural limitations, inadequate training, and contextual challenges. Research from both global and Philippine settings underscores the critical importance of addressing these systemic barriers to unlock the full potential of ICT in mathematics instruction.

Notably, while several Philippine studies have examined ICT integration in urban, suburban, and semi-urban contexts, there remains a significant gap in research focused on truly remote, indigenous, and GIDA communities such as Tinglayan District in Kalinga. The existing body of literature does not adequately capture the lived experiences and perceptions of teachers in such contexts, where geographic isolation compounds the challenges of ICT integration in distinctive ways. This study addresses that gap by providing an empirically grounded account of teacher perceptions and ICT integration practices in one of

the most geographically challenging educational districts in the Philippines, thereby contributing context-sensitive knowledge that can inform targeted policy and programmatic interventions.

Finally, according to World Bank (2024), digital transformation in Philippine education requires not only infrastructure but also policies that support teacher training, equitable access, and contextualized ICT tools for schools in remote areas. The report concluded that empowering teachers with the right skills and resources is critical to bridging the digital divide in education.

3. RESEARCH DESIGN AND METHODOLOGY

This chapter presents the results of the study on the perceptions of elementary teachers in Tinglayan District, Schools Division of Kalinga, on the integration of Information and Communication Technology (ICT) in Mathematics instruction. The findings are organized and discussed according to the specific objectives of the study.

Research Design

This study employed a descriptive-correlational with comparative analysis research design to investigate the interegration of ICT in teaching math in elementary schools in Tinglayan District,Kalinga. The descriptive method was used to determine the teacher's profile, the extent of ICT integration, the perception of the teachers on ICT use and the challenges encountered in integrating ICT in classroom instruction. The comparative design looked into the analysis of profile variables versus the usefulness and ease of use.

Meanwhile, the correlational aspect examined the relationship between relevance of ICT resources of resources as to whether there are significant differences of their perceptions when they are grouped according to their profile. This approach allowed for the statistical analysis of weather more positive perceptions associated with higher level of ICT utilization in the classroom.

The correlational design investigated the degree of relationship between the extent of ICT use and the extent of ICT integration and whether the relationship is significant. A structured survey-questionnaire served as the main data-gathering instrument. It consisted of Likert-type items to quantify the sufficiency of ICT resources, perception levels, and frequency of ICT use. In addition, the instrument includes open-ended questions, which provided qualitative insights that further explained and contextualized the quantitative results particularly regarding barriers to ICT integration and recommendations for improvement. These qualitative responses will undergo thematic content analysis, allowing the researcher to identify patterns and themes that enhance the interpretation of the statistical findings.

This combination of quantitative and supportive qualitative data strengthens the study by providing a comprehensive understanding of ICT integration in Mathematics instruction. The design is therefore appropriate for investigating existing conditions, identifying relationships among variables, and capturing the unique contextual challenges experienced by teachers in rural and mountainous elementary schools in Tinglayan, Kaling.

Locale and Population of the Study

This study was conducted among the elementary schools in the Municipality of Tinglayan, Kalinga, Philippines. Tinglayan is one of the municipalities under the Schools Division of Kalinga. Tinglayan is a mountainous, rural municipality composed of 20 barangays. The geographical context of Tinglayan with its rural and often remote barangays, rugged terrain, and limited infrastructure is especially relevant considering the focus of the study on ICT integration in mathematics instruction under potentially constrained conditions.

Table 1 presents the population of the study according to Sex.

Table 1. Profile of Respondents in Terms of Sex

Sex	Frequency	Percentage
Male	10	8.3
Female	111	91.7
Total	**121**	**100**

Table 1 presents the sex distribution of the 121 respondents. The data reveal a predominance of female teachers (n = 111, 91.7%) over male teachers (n = 10, 8.3%). This distribution reflects the feminized nature of elementary education in the Philippines, a pattern consistently documented in national and regional education statistics. The significant gender gap in the sample is particularly notable in the context of Tinglayan District, where teaching in remote barangay schools remains largely a female-dominated profession. This demographic reality is relevant to the subsequent analysis of gender-based differences in ICT perception, as sex has been identified in prior research as a potential moderating factor in technology adoption.

Table 2 presents the population of the study according to Age.

Table 2. Profile of Respondents in Terms of Age

Age	Frequency	Percentage
25-34	23	19
35-44	38	31.4
45-54	40	33.1
55 and above	20	16.5
Total	**121**	**100**

The age distribution in Table 2 shows that the majority of respondents fall within the middle to late career stages of teaching, with the 45–54 age bracket comprising the largest proportion (33.1%), followed closely by the 35–44 group (31.4%). Teachers aged 25–34 comprised 19.0% of respondents, while those 55 years and above represented 16.5%. The predominance of mid-career to senior teachers is significant because research consistently shows that older teachers tend to have lower confidence in ICT use and are more resistant to technology adoption compared to their younger counterparts (Basmayor, 2024; Gamit, 2023). This age profile of the respondent group may thus influence the overall perceptions of ICT integration observed in the study.

Table 3 presents the profile of the respondents according to their highest educational attainment.

Table 3. Profile of Respondents in Terms of Highest Educational Attainment

Highest Educational Attainment	Frequency	Percentage
Bachelor's Degree	29	24
Bachelor's Degree with Masters unit	54	44.6
Master's Degree	29	24
Master's Degree with PhD Unit	8	6.6
Doctorate Degree	1	.8
Total	**121**	**100**

Table 3 shows that the majority of respondents (44.6%) held a Bachelor's Degree with Master's units, indicating that many teachers are pursuing advanced studies while actively teaching. An equal proportion

(24.0% each) had either a Bachelor's Degree or a full Master's Degree, while a small group (6.6%) held a Master's Degree with doctoral units, and only one (0.8%) had a Doctorate Degree. This distribution suggests a moderately educated teaching workforce with many engaged in academic progression. Higher educational attainment has been associated in prior research with more positive perceptions of ICT and greater willingness to integrate technology into instruction, which is relevant for interpreting the perception data in subsequent sections.

Table 4 presents the profile of the respondents according to their years of teaching experience.

Table 4. Profile of Respondents in Terms of Years of Teaching Experience

Years of Teaching Experience	Frequency	Percentage
Less than 1 year	5	4.1
1-4 years	13	10.7
5-9 years	14	11.6
10-14 years	36	29.8
15 years and above	53	43.8
Total	**121**	**100**

Table 4 reveals that a substantial majority of respondents (43.8%) had 15 or more years of teaching experience, indicating a highly experienced teaching force in Tinglayan District. Another 29.8% had 10–14 years of experience, and the remaining 25.9% were relatively early-career teachers with fewer than 10 years of service. The high concentration of experienced teachers is a double-edged factor: while experience brings pedagogical wisdom and community familiarity, research indicates that long-tenured teachers are sometimes less inclined to adopt new technologies, particularly when ICT training has been limited (Arnado & Aviles, 2023; Qasem, 2016).

Table 5 presents the profile of the respondents according to the grade level they teach.

Table 5. Profile of Respondents in Terms of Grade Level

Grade Level	Frequency	Percentage
Grade 1	19	15.7
Grade 2	14	11.6
Grade 3	14	11.6
Grade 4	27	22.3
Grade 5	16	13.2
Grade 6	17	14
Multigrade	14	11.6
Total	121	100

Table 5 shows that Grade 4 teachers comprised the largest proportion (22.3%) of respondents, while Grade 1 teachers constituted the next largest group (15.7%). The distribution across grade levels was fairly balanced, with multigrade teachers representing 11.6% of the respondent pool. The presence of multigrade teachers is particularly notable in the context of Tinglayan, where several small schools combine multiple grade levels due to limited teacher positions. ICT integration in multigrade settings presents unique pedagogical challenges and opportunities, making this subgroup particularly interesting for analysis.

Table 6 presents the profile of the respondents in terms of ICT-Related Training Attended in the Last Two Years

Table 6. Do you have ICT-related training in the last 2 Years?

Responses	Frequency	Percentage
YES	26	21.5
NO	95	78.5
Total	121	100

A striking finding presented in Table 6 is that only 26 out of 121 teachers (21.5%) reported having received ICT-related training in the past two years, while an overwhelming majority (78.5%) had not. This alarming gap in ICT training access is a critical factor in understanding the subsequent data on ICT perception and integration. Among those who did receive training, the seminars attended (Table 11) included Microsoft 365/MS Office and DCP/DCP Adoption (tied at rank 1.5), followed by Canva/Canva Education and Learning Resources Development (tied at rank 3.5). The narrow range and basic nature of the training topics underscore the limited depth of ICT capacity-building available to Tinglayan District teachers. This finding is consistent with Cabansag (2025) and Bartolome (2023), who both noted that teachers in remote Philippine districts often lack access to advanced and contextually relevant ICT training.

Table 7 presents the profile of the respondents in terms of Seminars Attended in the Last Two Years.

Table 7. Seminars Attended by Teachers for the last 2 years

Seminars	**Frequency**	**Rank**
.Microsoft 365 / MS Office	4	1.5
.DCP / DCP Adoption	4	1.5
.Canva / Canva Education	3	3.5
.Learning Resources Development	3	3.5
.Digitalization / Digitization	2	6
.Multimedia & Digital Tools	2	6
.MATATAG LMS / E-Library	2	6
.Google NotebookLM	1	10.5
.MAPEH Digital Workshop	1	10.5
.MTDP	1	10.5
.DICP	1	10.5
.Developing IMS using ICT	1	10.5
.Development and Quality of Learning Resources	1	10.5
Total	26	

On ICT-related trainings attended within the last two years as gleaned in Table 7, only 26 respondents or 21.5 percent reported attending ICT-related seminars, while 95 respondents or 78.5 percent indicated that they had not attended any ICT training. Among the seminars attended, Microsoft 365/MS Office and DCP/DCP Adoption were the most common. Other trainings included Canva Education, Learning Resources Development, Digitalization, Multimedia Tools, MATATAG LMS, and Google NotebookLM. The findings suggested that opportunities for ICT professional development remain limited among teachers in GIDA schools.

Scope and Limitation of the Study

The study is limited to ICT tools and resources directly utilized in Mathematics teaching, such as computers, projectors, tablets, educational software, internet connectivity, and multimedia devices. It does not investigate ICT use in other subjects or consider student perceptions and performance outcomes.

Additionally, the findings are confined to the Tinglayan District and may not fully represent the situation of other districts in Kalinga or the Philippines. External factors such as budget allocation, infrastructure projects, procurement processes, and support from local government units are acknowledged but are not extensively analyzed.

Despite these limitations, the study aims to provide valuable baseline information that can support improved ICT integration strategies for enhanced Mathematics instruction in remote elementary schools.

Data Gathering Instrument

The researcher used a modified survey questionnaire in gathering the data. Indicators were lifted from the different questionnaires of researchers such as F. Davis, 2025; Prem Kumari Dhakal, 2018 and N. Tamayo 2024.

Validity and Reliability of the Instrument

To ensure the consistency and dependability of the results, the researcher-made questionnaire underwent validity of the instrument by 5 experts in the field of ICT. Pilot test was conducted involving a small group of elementary school teachers from a neighboring district not included in the actual study. The reliability of the Likert-scale items was determined using Cronbach's Alpha, a statistical measure commonly used to assess the internal consistency of survey instruments. A Cronbach's Alpha coefficient of 0.70 or higher was considered acceptable.

The result was indicated in the table below.

The reliability test results of the research instrument using Cronbach's Alpha. The questionnaire obtained an overall Cronbach's Alpha value greater than .70, which indicates that the instrument possesses acceptable to excellent internal consistency. This suggests that the items included in the questionnaire were closely related and consistently measured the variables intended in the study. The result further implies that the research instrument was reliable and suitable for data gathering, ensuring that the responses obtained from the participants were dependable for analysis and interpretation. Hence, the questionnaire was considered valid for use in conducting the study and in achieving the objectives of the research.

The instrument obtained an overall Cronbach's Alpha value of .891, which indicates excellent internal consistency among the indicators used in the study. This means that the items in the questionnaire consistently measured the intended variables and were therefore reliable for data gathering.

Data Gathering Procedure

Prior to the data collection, a formal request letter for permission to conduct the study was submitted to the Office of the Schools Division Superintendent, followed by coordination with the Public Schools District Supervisor (PSDS) and school heads of the participating elementary schools in Tinglayan District. Upon approval, the researcher personally administered the questionnaire to the teacher-respondents to ensure clarity of instructions and voluntary participation. Before answering the instrument, teachers were provided with an Informed Consent Form explaining the purpose of the study, confidentiality of responses, and their right to withdraw at any point without penalty. The questionnaires were administered through printed copies. Respondents were given sufficient time to complete the survey, and the researcher collected the accomplished instruments immediately after completion or at an agreed time for retrieval. The collected data were then encoded, organized, and subjected to appropriate statistical analysis. All data obtained were handled with strict confidentiality and used solely for academic and research purposes.

Data Analysis

The data gathered in this study were analysed using both descriptive and inferential statistics. Frequency counts and percentages were used to describe the demographic profile of the respondents and the availability of ICT resources. Weighted means were computed to determine the sufficiency of ICT resources, the level of teachers' perceptions on the usefulness, ease of use, and relevance of ICT, and the extent of ICT integration in Mathematics instruction. To test for significant differences in teachers' perceptions when grouped according to profile variables, the t-test was used for sex, while One-Way Analysis of Variance (ANOVA) was applied for age, educational attainment, years of teaching experience, and grade level taught. For the extent of ICT integration, the Mann-Whitney U test was used for sex, and the Kruskal-Wallis H test was employed for the remaining profile variables, as the data did not meet the assumptions for parametric testing. Pearson Product Moment Correlation was used to determine the relationship between teachers' perceptions of ICT usefulness and the extent of ICT integration in Mathematics instruction. Responses to open-ended questions were subjected to thematic analysis to identify recurring patterns and themes related to the challenges encountered by teachers in integrating ICT in the GIDA context. All statistical computations were processed using the Statistical Package for the Social Sciences (SPSS).

The responses to open-ended questions were subjected to thematic analysis to identify recurring patterns and themes related to the challenges encountered by teachers in integrating ICT in the GIDA context. The responses were carefully examined, coded, and grouped into major themes such as lack of student devices, unstable internet connectivity, frequent power interruptions, insufficient ICT-related training, lack of technical support, curriculum and digital tool misalignment, and language or mother tongue limitations in Mathematics instruction. These themes provided deeper qualitative insights that supported and validated the quantitative findings of the study.

Treatment of Data

The following numerical and descriptive scales were utilized using the following:

Table 9 presents the scale used in determining the extent of sufficiency of ICT resources in the elementary schools of Tinglayan District. The scale includes the range, verbal interpretation, and corresponding description used in interpreting the responses of the respondents.

Table 9. Extent of sufficiency of ICT Resources in the Elementary schools Tinglayan District, the scale will be used.

Scale	Range	Verbal Interpretation	Description
5	4.21-5.00	Very Sufficient	The ICT resource is more than adequate and supports all teaching needs effectively.
4	3.41-4.20	Sufficient	The ICT resource adequately supports teaching needs with minor limitations.
3	2.01-3.40	Moderately Sufficient	The ICT resource is limited; supports teaching needs only sometimes.
2	1.81-2.60	Insufficient	The ICT resource rarely usable or inadequate in quantity/quality.
1	1-1.80	Very Insufficient	The ICT resource is not functional at all.

Table 10 presents the scale used in determining the level of agreement of the respondents relative to the usefulness, ease of use, and relevance of ICT resources in teaching Mathematics. The scale includes the range, verbal interpretation, and corresponding description used in interpreting the responses of the respondents.

Table 10. Level of agreement relative to the usefulness, ease of using and relevance of ICT resources in Teaching Mathematics

Scale	Range	Verbal Interpretation	Description
5	4.21-5.00	Strongly Agree	Very positive
4	3.41-4.20	Agree	Positive
3	2.01-3.40	Neutral	Moderate
2	1.81-2.60	Disagree	Negative
1	1-1.80	Strongly Disagree	Very Negative

Table 11 presents the scale used in determining the extent of ICT integration in Mathematics instruction.

Table 11. Determine the extent of ICT integration in Mathematics Instruction

Scale	Range	Verbal Interpretation	Description
5	4.21-5.00	Very Great extent	The event always or almost happens
4	3.41-4.20	Great Extent	The event happens frequently
3	2.01-3.40	Moderately Extent	The event happens with some regularity, but not consistently
2	1.81-2.60	Low Extent	The event happens infrequently
1	1-1.80	Very Low Extent	The event never happens

Table 12 presents the scale used in determining the seriousness of the challenges and barriers affecting ICT integration in Mathematics instruction in a GIDA context.

Table 12. Determine the seriousness of each Challenges and barriers in preventing ICT integration in Mathematics Instruction in a GIDA Context

Scale	Range	Verbal Interpretation	Description
5	4.21-5.00	Very serious Problem	Always a problem
4	3.41-4.20	Serious Problem	Often
3	2.01-3.40	Moderate Problem	Sometimes
2	1.81-2.60	Slightly Serious Problem	Rarely
1	1-1.80	Not a Problem	Never a problem

4. RESULTS AND DISCUSSION

This chapter presents the results of the data gathered from the 121 elementary school teachers of Tinglayan District, Schools Division of Kalinga, regarding their perceptions on the integration of Information and Communication Technology (ICT) in Mathematics instruction. The findings are organized and discussed in accordance with the specific objectives of the study.

Availability and Sufficiency of ICT Resources

The following table presents the availability and sufficiency of ICT resources in the elementary schools of Tinglayan District as perceived by the teacher-respondents.

Table 13. Availability and Sufficiency of ICT Resources in Tinglayan District Elementary Schools

ICT Resources	AVAILABILITY		SUFFICIENCY	
	Availability	Percentage	Mean	DI
.Computers/laptops for teachers	111	91.7	3.92	Sufficient
.Student computers/tablets	4	3.3	1.50	Very Insufficient
.Projector/TV Display	109	90.1	3.62	Sufficient
.Internet Connectivity	110	90.9	3.68	Sufficient
.Wi-Fi/Network access	109	90.1	3.65	Sufficient
.Math software/educational apps	14	11.6	1.69	Very Insufficient
.Printer/scanner	108	89.3	4.04	Sufficient
.Reliable electricity supply	115	95	4.24	Very Sufficient
.Smartphone/Mobile Data	76	62.8	3.23	Moderately Sufficient
.Backup power source	9	7.4	1.63	Very Insufficient
Grand Mean			**3.12**	**Moderately Sufficient**

Table 13 presents data on the availability and sufficiency of ICT resources in elementary schools across Tinglayan District. The overall grand mean of 3.12 (Moderately Sufficient) indicates that while some basic ICT infrastructure exists, significant gaps remain, particularly in resources essential for student-centered ICT activities.

The presentation of Table 13 provides a clearer understanding of the current condition of ICT resources available in Tinglayan District elementary schools and serves as a basis for evaluating the adequacy of technological support for Mathematics instruction.

Among the resources available, reliable electricity supply emerged as the most sufficient (Mean = 4.24, Very Sufficient), and was available in 95.0% of schools a critical prerequisite for any ICT integration. Teacher computers/laptops (91.7%), projectors/TV displays (90.1%), internet connectivity (90.9%), Wi-Fi/network access (90.1%), and printers/scanners (89.3%) were all reported as sufficient and widely available. However, sufficiency means corresponding to the teachers' own use rather than whole-school deployment.

In stark contrast, student computers/tablets were available in only 3.3% of schools (Mean = 1.50, Very Insufficient), math software and educational apps in only 11.6% (Mean = 1.69, Very Insufficient), and backup power sources in only 7.4% (Mean = 1.63, Very Insufficient). Smartphones with mobile data showed moderate availability (62.8%) but only moderate sufficiency (Mean = 3.23). These findings reveal

a significant digital asymmetry: while teachers may have basic tools for their own use, the infrastructure needed to facilitate student-engaged ICT learning is severely deficient. This pattern is consistent with Mensah and Nabie (2021), who found that rural schools in Ghana had limited access to ICT tools for students, and with UNESCO (2022), which emphasized the risk of schools in remote areas being left behind in digital transformation. In the Philippine context, Arnado and Aviles (2023) similarly documented that IP schools in Mindanao faced device scarcity, directly constraining student participation in ICT-enhanced lessons.

The findings imply that attention should be given not only to ICT resources rated as "Very Insufficient" such as student computers/tablets, backup power sources, and mathematics software, but also to those rated as "Moderately Sufficient" such as smartphones/mobile data since these resources still limit effective ICT integration.

Table 14. Mean level of agreement relative to the usefulness of ICT resources in Teaching Mathematics

Indicators	Mean	Descriptive Interpretation
1.ICT helps me explain Mathematics concepts more clearly even with limited physical teaching materials available in our GIDA schools.	4.31	Strongly Agree
2.Using ICT allows me to provide visual representations (e.g., shapes, graphs, models) that are otherwise difficult to demonstrate without such tools.	4.50	Strongly Agree
3.ICT helps bridge gaps in instructional delivery caused by class interruptions due to weather or road inaccessibility.	4.36	Strongly Agree
4.ICT enables me to provide remedial lessons or enrichment activities despite the remote location of the school.	4.39	Strongly Agree
5.ICT-supported resources help me reduce preparation time for Math lessons.	4.36	Strongly Agree
6.ICT improves the participation and interest of students who have limited exposure to digital tools in this GIDA setting.	4.38	Strongly Agree
7.ICT helps me deliver more accurate and up-to-date mathematical examples even when printed resources are scarce.	4.36	Strongly Agree
8.ICT supports differentiated teaching to accommodate diverse learning levels in multigrade classes.	4.40	Strongly Agree
9.ICT helps me overcome limitations in manipulating physical math teaching aids by offering virtual alternatives.	4.31	Strongly Agree
Mean	**4.37**	**Strongly Agree**

Table 14 presents teachers' level of agreement on the usefulness of ICT in Mathematics instruction. With an overall mean of 4.37 (Strongly Agree), teachers expressed very strong positive perceptions of ICT's

utility in their teaching context. The highest-rated item was ICT's ability to provide visual representations such as shapes, graphs, and models (Mean = 4.50), reflecting the particular value that digital tools hold in a setting where physical teaching materials are scarce. The second-highest rating went to ICT's capacity to support differentiated instruction in multigrade classes (Mean = 4.40), underscoring the practical relevance of ICT for the complex pedagogical demands of multigrade teaching in GIDA schools.

Teachers also strongly agreed that ICT enables remedial and enrichment activities despite geographic remoteness (Mean = 4.39), improves student participation and interest in a resource-limited setting (Mean = 4.38), and bridges instructional gaps caused by weather and road inaccessibility a particularly salient concern in Tinglayan's mountainous terrain (Mean = 4.36). These findings align closely with the conclusions of Enorme et al. (2023), who identified learner engagement, innovative pedagogies, and improved assessment as key benefits of ICT in mathematics. The results also corroborate Lucas (2023), who linked teacher ICT confidence with better student outcomes, and Tindowen et al. (2019), who demonstrated that ICT enhances motivation and supports differentiated instruction.

Table 15 presents the mean level of agreement of the respondents relative to the ease of using ICT resources in teaching Mathematics. It shows the respondents' perceptions regarding the usability and accessibility of ICT tools in a GIDA context.

Table 15. Mean level of agreement relative to the ease of using ICT resources in Teaching Mathematics

Indicators	Mean	Descriptive Interpretation
1. I find it easy to operate ICT tools available in our school despite limited technical support in Tinglayan.	4.07	Agree
2. The ICT devices provided (e.g., laptops, projectors) work smoothly even with intermittent electricity or fluctuating voltage.	3.85	Agree
3. I can use basic educational software for Mathematics without needing constant assistance from others.	3.58	Agree
4. I am able to troubleshoot simple ICT problems on my own despite the absence of on-site ICT personnel.	3.34	Unsure
5. ICT tools in our school are user-friendly even for teachers with limited ICT training exposure due to geographic constraints.	3.87	Agree
6. Uploading or accessing digital mathematics resources is manageable even with slow or unstable internet connectivity.	3.55	Agree
7. I feel confident using ICT for lesson planning even when training opportunities are limited because of travel distance.	3.82	Agree
8. The ICT tools available do not require advanced skills that are difficult to acquire in our remote location.	3.60	Agree
9. ICT devices available are simple enough to operate despite being older or less updated compared to those in more accessible schools.	3.87	Agree
Mean	**3.73**	**Agree**

The overall mean of 3.73 indicates that teachers generally agree that ICT resources are relatively easy to use in Mathematics instruction despite the challenges associated with remote and geographically isolated school settings.

Table 15 shows teachers' perceptions of the ease of using ICT in Mathematics instruction, with an overall mean of 3.73 (Agree). While teachers generally agreed that ICT tools are manageable in their context, the ratings were notably lower than those for usefulness, indicating that ease of use remains a relative concern even as teachers acknowledge the value of ICT.

The findings imply that although teachers generally perceive ICT tools as manageable, there is still a need for continuous technical assistance and capacity-building activities, particularly in troubleshooting and independent ICT management.

The highest-rated item was ease of operating ICT tools despite limited technical support (Mean = 4.07), suggesting that basic operability is achievable for most teachers. Items regarding user-friendliness and device reliability also received moderate to good ratings (Means 3.85–3.87). However, the ability to troubleshoot ICT problems independently a critical skill in a GIDA setting where on-site technical personnel are absent received the lowest rating of 3.34 (Unsure), indicating a significant gap. This finding resonates with Zamir and Ali (2023), who similarly found that limited institutional support constrains teacher confidence in troubleshooting and independent ICT use. It is also consistent with Arnado and Aviles (2023), who noted that teachers in remote schools particularly struggle with the absence of technical support. The TAM framework (Davis, 1989) suggests that perceived ease of use is a key predictor of technology adoption; these findings therefore imply that further targeted support particularly in building independent ICT troubleshooting capacity could significantly enhance integration levels in Tinglayan.

This finding suggests the need for mentor teachers, ICT coordinators, and school administrators to provide additional technical assistance and coaching, particularly in troubleshooting simple ICT-related problems. Since teachers were unsure about their ability to independently troubleshoot ICT concerns (Mean = 3.34), capacity-building activities such as hands-on ICT workshops, peer mentoring, and school-based technical support mechanisms may help improve teachers' confidence and competence in managing ICT-related challenges in Mathematics instruction.

Table 16. T- Test Result Regarding the level of agreement relative to the usefulness, ease of use and relevance of ICT resources in Teaching Mathematics Instruction

Dimension	Sex	Mean	Descriptive Interpretation	*P*
Usefulness	Male	4.33	Strongly Agree	.612 $_{ns}$
	Female	4.38	Strongly Agree	
Ease of Use	Male	3.69	Agree	.273$_{ns}$
	Female	3.73	Agree	
Relevance	Male	3.93	Agree	.004*
	Female	4.13	Agree	
Overall	Male	3.99	Agree	.151 $_{ns}$
	Female	4.08	Agree	

Legend: * significant; ns – not significant

Table 16 presents the results of t-tests comparing teacher perceptions by sex. The data show that no significant difference existed between male and female teachers in their perceptions of ICT usefulness (p

= .612), ease of use (p = .273), and overall perception (p = .151). However, a statistically significant difference was found in the relevance dimension (p = .004), with female teachers (Mean = 4.13) perceiving ICT as more contextually relevant to their Mathematics instruction than male teachers (Mean = 3.93). Despite this single significant difference, both groups remained in the "Agree" verbal category, suggesting that the practical magnitude of the difference is modest. This finding partially supports the null hypothesis, which is rejected only for the relevance dimension. The result aligns with Marquez-Balda (2025), who found that attitude scores (which encompass perceptions of relevance) varied by demographic characteristics, and may reflect female teachers' greater tendency to emphasize contextual and student-centered dimensions of technology use.

The significant difference reflected a small effect size, indicating that although female teachers perceived ICT as more relevant than male teachers, the magnitude of the difference was minimal.

Table 17 presents the means and ANOVA results on the level of agreement of the respondents relative to the usefulness, ease of use, and relevance of ICT resources in teaching Mathematics instruction when grouped according to age.

Table 17. Means and ANOVA results the level of agreement relative to the usefulness, ease of use and relevance of ICT resources in Teaching Mathematics Instruction as to Age.

Dimension	Age	Mean	Descriptive Interpretation	*P*
Usefulness	25-34	4.63	Strongly Agree	.108 ns
	35-44	4.35	Strongly Agree	
	45-54	4.29	Strongly Agree	
	55 and above	4.29	Strongly Agree	
Ease of Use	25-34	3.85	Agree	.240ns
	35-44	3.85	Agree	
	45-54	3.65	Agree	
	55 and above	3.50	Agree	
Relevance	25-34	4.38	Strongly Agree	.068ns
	35-44	4.07	Agree	
	45-54	4.02	Agree	
	55 and above	4.08	Agree	
Overall	25-34	4.29	Strongly Agree	.106 ns
	35-44	4.09	Agree	
	45-54	3.99	Agree	
	55 and above	3.96	Agree	

Table 17 shows that no statistically significant differences were found across age groups in any of the perception dimensions: usefulness (p = .108), ease of use (p = .240), relevance (p = .068), or overall (p = .106). Although descriptively, younger teachers aged 25–34 recorded slightly higher means across all dimensions particularly for usefulness (Mean = 4.63) these differences were not statistically significant. This finding is somewhat surprising given prior research suggesting generational differences in ICT adoption (Basmayor, 2024; Qasem, 2016). A plausible explanation is that in Tinglayan's isolated context,

all teachers regardless of age face similar constraints and have developed comparable adaptive strategies for ICT use, moderating the effect of generational differences. The null hypothesis is retained for all age group comparisons.

The implication of this finding is that ICT integration initiatives and training programs may be implemented across all age groups since perceptions toward ICT were generally comparable regardless of age.

Table 18 presents the means and ANOVA results on the level of agreement of the respondents relative to the usefulness, ease of use, and relevance of ICT resources in teaching Mathematics instruction when grouped according to highest educational attainment.

Table 18. Means and ANOVA results the level of agreement relative to the usefulness, ease of use and relevance of ICT resources in Teaching Mathematics Instruction as to Highest Educational Attainment.

Dimension	Highest Educational Attainment	Mean	Descriptive Interpretation	*P*
Usefulness	Bachelor's Degree	4.18	Agree	.061 $_{ns}$
	Bachelor's Degree w/ Master's unit	4.35	Strongly Agree	
	Master's Degree	4.59	Strongly Agree	
	Master's Degree w/PhD unit	4.53	Strongly Agree	
	Doctorate Degree	4.00	Agree	
Ease of Use	Bachelor's Degree	3.62	Agree	.263$_{ns}$
	Bachelor's Degree w/ Master's unit	3.65	Agree	
	Master's Degree	3.88	Agree	
	Master's Degree w/PhD unit	4.14	Agree	
	Doctorate Degree	3.67	Agree	
Relevance	Bachelor's Degree	4.00	Agree	.369$_{ns}$
	Bachelor's Degree w/ Master's unit	4.11	Agree	
	Master's Degree	4.15	Agree	
	Master's Degree w/PhD unit	4.44	Strongly Agree	
	Doctorate Degree	4.00	Agree	
Overall	Bachelor's Degree	3.93	Agree	.127 $_{ns}$
	Bachelor's Degree w/ Master's unit	4.04	Agree	
	Master's Degree	4.20	Agree	
	Master's Degree w/PhD unit	4.37	Strongly Agree	
	Doctorate Degree	3.89	Agree	

Table 18 shows that no significant differences were found in teacher perceptions across levels of educational attainment for any dimension: usefulness (p = .061), ease of use (p = .263), relevance (p = .369), or overall (p = .127). Descriptively, teachers with a Master's Degree and those with a Master's Degree plus doctoral units tended to report higher mean scores across dimensions, suggesting that advanced education may foster more nuanced and positive views of ICT. However, the absence of statistical significance partly attributable to the small sample sizes in the higher attainment categories means the null hypothesis is retained. This finding is consistent with Basmayor (2024), who found that

while educational attainment influences ICT awareness, the relationship does not always produce statistically distinguishable differences in perception.

Table 19 presents the means and ANOVA results on the level of agreement of the respondents relative to the usefulness, ease of use, and relevance of ICT resources in teaching Mathematics instruction when grouped according to years in teaching.

Table 19. Means and ANOVA results the level of agreement relative to the usefulness, ease of use and relevance of ICT resources in Teaching Mathematics Instruction as to Years in Teaching

Dimension	Years in Teaching	Mean	Descriptive Interpretation	*P*
Usefulness	Less than 1 year	4.44	Strongly Agree	.701 $_{ns}$
	1-4 years	4.48	Strongly Agree	
	5-9 years	4.50	Strongly Agree	
	10-14 years	4.28	Strongly Agree	
	15 years and above	4.37	Strongly Agree	
Ease of Use	Less than 1 year	3.64	Agree	.566$_{ns}$
	1-4 years	3.75	Agree	
	5-9 years	4.02	Agree	
	10-14 years	3.73	Agree	
	15 years and above	3.65	Agree	
Relevance	Less than 1 year	4.40	Strongly Agree	.082$_{ns}$
	1-4 years	4.25	Strongly Agree	
	5-9 years	4.39	Strongly Agree	
	10-14 years	3.98	Agree	
	15 years and above	4.07	Agree	
Overall	Less than 1 year	4.16	Agree	.358 $_{ns}$
	1-4 years	4.16	Agree	
	5-9 years	4.30	Strongly Agree	
	10-14 years	4.00	Agree	
	15 years and above	4.03	Agree	

Table 19 confirms that no significant differences existed in teacher perceptions based on years of teaching experience across all dimensions: usefulness ($p = .701$), ease of use ($p = .566$), relevance ($p = .082$), or overall ($p = .358$). Interestingly, teachers with 5–9 years of experience recorded slightly higher means in several dimensions, while the most experienced group (15 years and above) remained in the "Strongly Agree" category for usefulness. This suggests that in Tinglayan's context, the length of teaching experience does not significantly differentiate how teachers perceive ICT. A plausible explanation is that the shared experience of teaching in a resource-constrained GIDA environment creates a common perspective regardless of experience level. The null hypothesis is fully retained for years of teaching experience.

Table 20 presents the means and ANOVA results on the level of agreement of the respondents relative to the usefulness, ease of use, and relevance of ICT resources in teaching Mathematics instruction when grouped according to grade level taught.

Table 20. Means and ANOVA results the level of agreement relative to the usefulness, ease of use and relevance of ICT resources in Teaching Mathematics Instruction as to Grade Level.

Dimension	Years in Teaching	Mean	Descriptive Interpretation	*P*
Usefulness	Grade 1	4.18	Strongly Agree	$.130_{ns}$
	Grade 2	4.08	Strongly Agree	
	Grade 3	4.37	Strongly Agree	
	Grade 4	4.49	Strongly Agree	
	Grade 5	4.45	Strongly Agree	
	Grade 6	4.58	Strongly Agree	
	Multigrade	4.37	Strongly Agree	
Ease of Use	Grade 1	3.50	Agree	$.052_{ns}$
	Grade 2	3.46	Agree	
	Grade 3	3.55	Agree	
	Grade 4	3.77	Agree	
	Grade 5	3.73	Agree	
	Grade 6	3.88	Agree	
	Multigrade	4.22	Strongly Agree	
Relevance	Grade 1	3.94	Agree	$.227_{ns}$
	Grade 2	3.89	Agree	
	Grade 3	4.02	Agree	
	Grade 4	4.28	Strongly Agree	
	Grade 5	4.22	Strongly Agree	
	Grade 6	4.15	Agree	
	Multigrade	4.20	Agree	
Overall	Grade 1	3.87	Agree	$.073_{ns}$
	Grade 2	3.81	Agree	
	Grade 3	3.98	Agree	
	Grade 4	4.18	Agree	
	Grade 5	4.13	Agree	
	Grade 6	4.20	Agree	
	Multigrade	4.26	Strongly Agree	

Table 20 shows that no statistically significant differences were found in teacher perceptions by grade level taught across all dimensions: usefulness (p = .130), ease of use (p = .052), relevance (p = .227), or overall (p = .073). Notable descriptive observations include the consistently higher scores reported by multigrade teachers across several dimensions — particularly ease of use (Mean = 4.22, Strongly Agree) and overall perception (Mean = 4.26, Strongly Agree). This may reflect multigrade teachers' heightened reliance on ICT as a practical tool for managing simultaneous instruction across multiple grade levels, fostering a more positive appraisal of ICT utility. The null hypothesis is retained for grade level as a moderating variable.

Despite the non-significant findings, the descriptive differences among grade levels suggest that upper-grade and multigrade teachers may rely more heavily on ICT tools because of the increasing complexity of Mathematics lessons.

Extent of ICT integration in Mathematics instruction.

Table 21 presents the mean on the extent of ICT integration in Mathematics instruction.

Table 21. Mean on the Extent of ICT Integration in Mathematics Instruction

Indicators	Mean	Descriptive Interpretation
1. I use ICT when planning Math lessons (searching for resources, preparing slides, interactive exercises)	4.13	Great Extent
2. I use ICT during classroom delivery (projecting lessons, simulations, interactive quizzes)	4.05	Great Extent
3. I use ICT for formative assessment (online quizzes, immediate feedback tools)	3.58	Great Extent
4. I use ICT for summative assessment (digital tests, grading tools)	3.81	Great Extent
5. I assign ICT-based enrichment tasks or projects for advanced learners.	3.49	Great Extent
6. I encourage collaborative ICT activities (group digital projects, shared docs).	3.61	Great Extent
7. I use ICT for record keeping and communication related to Math instruction (grades, parent messages)	4.09	Great Extent
Mean	**3.82**	**Great Extent**

Table 21 reveals that the overall extent of ICT integration in Mathematics instruction was rated at a great extent (Mean = 3.82), indicating that teachers in Tinglayan District are meaningfully, if not maximally, incorporating ICT into their teaching practice across multiple dimensions. The highest-rated integration activity was ICT use in lesson planning (Mean = 4.13), followed by record keeping and communication (Mean = 4.09), and classroom delivery (Mean = 4.05). These findings suggest that teachers are most comfortable using ICT for their own preparatory and administrative tasks rather than for direct student-facing activities.

The findings imply that teachers have already begun integrating ICT meaningfully in Mathematics instruction; however, integration remains largely teacher-centered due to limited student access to digital devices and internet resources.

To further support the quantitative findings, the responses from the open-ended questions were analyzed thematically to identify the specific challenges encountered by teachers in integrating ICT in Mathematics instruction.

Table 22 presents the Mann-Whitney U test results on the extent of ICT integration in Mathematics instruction when grouped according to sex.

Themes Generated from Open-Ended Responses

Based on the responses gathered from the open-ended questions, several common challenges affecting ICT integration in Mathematics instruction were identified. Such as, lack of student ICT devices, unstable electricity and internet connectivity, limited ICT training and technical support, curriculum and digital tool misalignment, and language and mother tongue limitations in Mathematics ICT resources.

The respondents revealed concerns regarding the limited availability of ICT devices for learners. Some respondents mentioned "lack of physical devices," "lack of pupils' devices at home," and "unequal student access to devices or internet." These responses support the quantitative findings in Table 13, where student computers/tablets obtained a mean of 1.50 interpreted as Very Insufficient. Another notable concern was the instability of electricity and internet connectivity in geographically isolated schools. Teachers stated "frequent power interruption" and "frequently interruptions of current." These findings confirm the challenges associated with sustaining ICT integration in remote schools despite the availability of basic ICT resources.

Teachers also highlighted limitations in their ICT competencies and technical support systems. Some responses included "many lack adequate training to use technology effectively" and "ignorance on the use of ICT." These responses support the findings in Table 15, particularly on the item regarding teachers' ability to troubleshoot ICT problems independently, which obtained the lowest mean of 3.34 interpreted as Unsure. Another important theme that emerged from the responses was the issue of curriculum and technology alignment. One teacher mentioned that "the curriculum and assessments don't always align with digital tools." This finding suggests that despite teachers' positive perceptions toward ICT, some available technologies may not fully match the instructional and assessment requirements in Mathematics. Additionally, some teachers raised concerns regarding the lack of localized and culturally responsive ICT materials. One respondent stated that "there is no mother tongue translation for some mathematical expressions/words." This finding highlights the need for culturally and linguistically appropriate ICT resources, particularly in indigenous and multilingual learning environments such as Tinglayan District. Overall, the qualitative findings validated the quantitative results and revealed that teachers in GIDA schools continue to experience infrastructural, pedagogical, technical, and contextual barriers that affect the effective integration of ICT in Mathematics instruction.

Table 22. Mann Whitney U Test on the Extent of ICT Integration in Mathematics Instruction as to Sex

Sex	N	Mean Rank	Sum of Ranks	*U*	*P*
Male	10	54.15	541.50	486.50	$.517_{ns}$
Female	111	61.62	6839.50		
Total	121				

Table 22 presents the Mann-Whitney U test results comparing the extent of ICT integration in Mathematics instruction between male and female teachers. The analysis yielded a U-value of 486.50 with a p-value of .517, which is not statistically significant. Although female teachers recorded a slightly higher mean rank (61.62) compared to male teachers (54.15), this difference was not sufficient to reach statistical significance. This finding suggests that sex does not meaningfully differentiate the degree to which teachers integrate ICT into Mathematics instruction in Tinglayan District. Both male and female teachers operate under the same infrastructural constraints and institutional conditions, which may level out any gender-based differences in ICT integration behavior. The null hypothesis is retained for sex as a moderating variable on the extent of ICT integration.

Table 23 presents the Kruskal-Wallis test results on the extent of ICT integration in Mathematics instruction when grouped according to age.

Table 23. Kruskal Wallis Test Result on the Extent of ICT Integration in Mathematics Instruction as to Age

Age	N	Mean Rank	X^2	*p-value*
25-34	23	64.87	1.606	$.658_{ns}$
35-44	38	63.54		
45-54	40	60.49		
55 and above	20	52.75		
Total	121			

Table 23 presents the Kruskal-Wallis H test comparing the extent of ICT integration across age groups. The result shows a chi-square value of 1.606 with a p-value of .658, indicating no statistically significant difference among the four age groups. Descriptively, younger teachers (25–34) recorded the highest mean rank (64.87), while those aged 55 and above had the lowest (52.75). Although this suggests a slight tendency for younger teachers to integrate ICT more frequently, the difference was not statistically meaningful. This aligns with the perception findings, where age also did not produce significant differences. The uniformity of the GIDA context with its shared resource limitations and training gaps likely minimizes generational differences in actual ICT integration frequency. The null hypothesis is retained for age as a moderating variable.

Table 24 presents the Kruskal-Wallis test results on the extent of ICT integration in Mathematics instruction when grouped according to highest educational attainment.

Table 24. Kruskal Wallis Test Result on the Extent of ICT Integration in Mathematics Instruction as to Highest Educational Attainment

Highest Educational Attainment	N	Mean Rank	X^2	*p-value*
Bachelor's Degree	29	53.29	8.834	$.065_{ns}$
Bachelor's Degree w/ Master's unit	54	56.71		
Master's Degree	29	76.76		
Master's Degree w/PhD unit	9	64.25		
Doctorate Degree	1	33.00		
Total	121			

Table 24 shows the Kruskal-Wallis H test results for the extent of ICT integration grouped by educational attainment. The chi-square value of 8.834 yielded a p-value of .065, which falls just above the .05 level of significance and is therefore considered not statistically significant. Nevertheless, the result is noteworthy as it approaches the threshold of significance, suggesting a trend worth monitoring. Descriptively, teachers holding a Master's Degree recorded the highest mean rank (76.76), substantially higher than those with only a Bachelor's Degree (53.29). This pattern implies that advanced academic preparation may cultivate greater engagement with ICT integration, possibly due to exposure to educational technology concepts in graduate coursework. The lone respondent with a Doctorate Degree recorded the lowest mean rank

(33.00), though this observation is statistically unreliable given the sample size of one. The null hypothesis is retained for educational attainment, though the borderline p-value warrants attention in future research with larger samples.

Table 25 presents the Kruskal-Wallis test results on the extent of ICT integration in Mathematics instruction when grouped according to years of teaching.

Table 25. Kruskal Wallis Test Result on the Extent of ICT Integration in Mathematics Instruction as to Years of Teaching.

Years of Teaching	N	Mean Rank	X^2	*p-value*
Less than 1 year	5	68.50	3.477	$.481_{ns}$
1-4 years	13	70.88		
5-9 years	14	68.71		
10-14 years	36	53.82		
15 years and above	53	60.71		
Total	**121**			

Table 25 presents the Kruskal-Wallis H test results for the extent of ICT integration as grouped by years of teaching experience. The chi-square value of 3.477 with a p-value of .481 confirms no statistically significant difference across experience groups. Descriptively, early-career teachers with 1-4 years of experience recorded the highest mean rank (70.88), followed closely by those with 5–9 years (68.71) and less than one year (68.50). Teachers with 10-14 years of experience had the lowest mean rank (53.82). This pattern may suggest that mid-career teachers who may have grown comfortable with traditional instruction show comparatively less ICT integration, while very early-career and newer teachers bring fresher digital habits into the classroom. However, since the difference is not statistically significant, caution is warranted in interpreting these descriptive trends. The null hypothesis is retained for years of teaching experience as a moderating variable.

Table 26 presents the Kruskal-Wallis test results on the extent of ICT integration in Mathematics instruction when grouped according to grade level.

Table 26. Kruskal Wallis Test Result on the Extent of ICT Integration in Mathematics Instruction as to Grade Level

Grade Level	N	Mean Rank	X^2	*p-value*
Grade 1	19	49.89	11.895	$.064_{ns}$
Grade 2	14	44.21		
Grade 3	14	70.46		
Grade 4	27	76.22		
Grade 5	16	56.59		
Grade 6	17	56.91		
Multigrade	14	64.04		
Total	121			

Table 26 presents the Kruskal-Wallis H test results for the extent of ICT integration by grade level taught. The chi-square value of 11.895 with a p-value of .064 falls just above the .05 significance threshold, indicating no statistically significant difference though the result again approaches the boundary of significance. Descriptively, Grade 4 teachers recorded the highest mean rank (76.22), followed by Grade 3 (70.46) and Multigrade teachers (64.04). Grade 2 teachers had the lowest mean rank (44.21), closely followed by Grade 1 (49.89). The higher integration rates among upper elementary grade teachers may reflect the greater complexity of mathematical content in Grades 4 and above, where visualization tools, graphs, and digital simulations are more readily applicable and pedagogically compelling. The near-significant chi-square value also suggests that grade level assignment may have a meaningful, if not yet statistically confirmed, influence on ICT integration frequency a relationship worth investigating in future studies with larger samples. The null hypothesis is retained for grade level as a moderating variable.
Despite the non-significant findings, the descriptive differences among grade levels suggest that upper-grade and multigrade teachers may rely more heavily on ICT tools because of the increasing complexity of Mathematics lessons.

Challenges and barriers experienced by teachers in ICT integration in Mathematics instruction in a GIDA context.

Table 27. Challenges and barriers experience by Teachers in ICT integration of Mathematics Instruction in a GIDA Context.

Indicators	Frequency	Percentage	Rank
1.Lack of physical devices (computers/tablets)	92	76	4
2.Unreliable or no internet connectivity	32	26.4	9
3.Frequent power interruptions.	79	65.3	5.5
4.Lack of technical support / maintenance.	79	65.3	5.5
5.Insufficient training on using ICT for Math instruction	103	85.1	1
6.Large class sizes that limit ICT use.	12	9.9	10
7.Lack of relevant digital/math resources in local language/context.	93	76.9	3
8.Low student digital literacy / lack of devices at home	100	82.6	2
9.Policy/administrative constraints (time, curriculum demands).	37	30.6	8
10.Cost of data / internet for teachers or students.	56	46.3	7

Table 27 presents the challenges and barriers identified by teachers in integrating ICT into Mathematics instruction in Tinglayan District's GIDA context. The most prevalent challenge was insufficient training on using ICT for Mathematics instruction, reported by 103 teachers (85.1%), followed by low student digital literacy and lack of home devices (82.6%) and the lack of relevant digital and math resources in local languages or cultural contexts (76.9%).
These top three barriers collectively point to a systemic failure in both capacity development and content localization. The fact that only 21.5% of teachers had received ICT training in the past two years (Table 10) directly explains the overwhelming training gap reported here. This finding is strongly supported by

Enorme et al. (2023), who identified insufficient teacher training as one of the most persistent barriers to effective ICT integration in Philippine mathematics education. The concern about low student digital literacy underscores the home-school digital divide, where students arrive in school without prior digital exposure, making ICT-mediated learning doubly challenging for teachers.

The third-ranked challenge lack of contextually relevant digital and math resources connects directly to the earlier finding that ICT relevance perceptions center on localization. While teachers see the potential for ICT to reflect Tinglayan culture and livelihoods, the resources to enable this are largely absent. Physical device shortages (76.0%), power interruptions (65.3%), and lack of technical support (65.3%) further compound these challenges. Cost of data and internet (46.3%) and policy constraints (30.6%) were also notable. Interestingly, unreliable internet connectivity (26.4%) and large class sizes (9.9%) were ranked lower, perhaps because many teachers have adapted to offline ICT use given the chronic connectivity limitations of the district. These findings collectively underscore the multidimensional nature of ICT integration barriers in GIDA educational settings, requiring systemic, multi-stakeholder responses.

Relationship between the usefulness of ICT and the extent of ICT integration in Mathematics instruction.

Table 28. Correlation between the Usefulness of ICT and the extent of integration of ICT in Mathematics instruction

Pearson Correlation	.620
N	121
p-value	**.001**

Legend: *significant

Table 28 presents the result of the Pearson Product Moment Correlation analysis between teachers' perceptions of ICT usefulness and the extent of ICT integration in Mathematics instruction. A significant positive correlation was found (r = .620, p = .000), indicating a strong and statistically significant relationship between the two variables. This means that teachers who hold more positive perceptions of ICT's usefulness are significantly more likely to integrate ICT more extensively into their Mathematics instruction.

This finding provides empirical support for the Technology Acceptance Model (Davis, 1989), which posits that perceived usefulness is a primary driver of technology adoption behavior. In the context of Tinglayan's GIDA schools, where external motivations such as regular supervision and training are limited, teachers' internal perceptions of ICT's value appear to play a particularly critical role in sustaining ICT integration. The moderate-to-strong correlation coefficient (r = .620) suggests that while perceptions are important, other factors such as resource availability, training, and contextual constraints also influence the extent of integration, explaining the variance not accounted for by perception alone.

This result aligns with Lucas (2023), who found that teacher preparedness and confidence in ICT directly correlate with higher levels of ICT use and improved student outcomes. It also corroborates Marquez-Balda (2025), who demonstrated that teachers with more positive attitudes toward ICT exhibit higher rates of technology adoption in their classrooms. For Tinglayan District, this finding carries an important practical implication: interventions that successfully shift teacher perceptions toward viewing ICT as useful and contextually relevant are likely to produce measurable increases in ICT integration, even in resource-constrained settings.

5. FINDING, CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

Based on the data gathered and analyzed, the following findings were drawn:

1. ICT resources in schools were generally moderately sufficient. Reliable electricity, laptops for teachers, internet connectivity, and projectors were available and sufficient. However, student devices, backup power supply, and math software were found to be very insufficient.
2. Teachers strongly agreed on the usefulness of ICT resources in Mathematics instruction and agreed on the ease of use and relevance of ICT resources. Teachers believed that ICT enhances lesson delivery, learner participation, visualization of concepts, and differentiated instruction.
3. No significant differences were found in teachers' perceptions on usefulness, ease of use, and overall perceptions of ICT resources when grouped according to profile variables, except in relevance according to sex.
4. Teachers integrated ICT in Mathematics instruction to a great extent, particularly in lesson planning, classroom delivery, and communication. No significant differences were found in the extent of ICT integration when grouped according to demographic profile.
5. The major challenges experienced by teachers included insufficient ICT training, low student digital literacy, lack of relevant digital resources, inadequate devices, power interruptions, and lack of technical support.
6. There was a significant positive relationship between the usefulness of ICT and the extent of ICT integration in Mathematics instruction. Teachers who perceived ICT as useful were more likely to integrate it extensively in teaching.

Conclusion

Based on the findings, the following conclusions are drawn:

1. The ICT infrastructure in Tinglayan District remains inadequate for student-centered ICT integration, despite basic teacher-facing resources being moderately available. The severe deficiency in student computers, math-specific software, and backup power constrains the scope and depth of ICT use in actual classroom learning.
2. Teachers in Tinglayan District hold uniformly positive perceptions of ICT across the dimensions of usefulness, ease of use, and relevance, suggesting that attitudinal barriers are not the primary obstacle to ICT integration. Rather, structural and systemic constraints particularly resource scarcity and the absence of regular training appear to be the dominant limiting factors.
3. Teacher perceptions do not significantly differ by most demographic profile variables, indicating that the challenges of and attitudes toward ICT integration in Tinglayan are experienced broadly and uniformly across the teaching workforce, irrespective of sex, age, educational attainment, experience, or grade level.
4. The significant positive correlation between ICT usefulness perceptions and the extent of integration confirms that strengthening teacher beliefs about ICT's practical value is a viable and important lever for increasing ICT use in classrooms. Teachers who believe in ICT integrate it more.
5. The persistent challenges of training deficiency, student digital illiteracy, and lack of contextually relevant digital resources reveal a systemic failure to build GIDA-responsive ICT capacity in Tinglayan District. Addressing these challenges requires coordinated intervention at the district, division, and regional levels.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are hereby offered:

1. School administrators and education officials may strengthen ICT infrastructure in GIDA schools through the provision of student devices, stable internet connectivity, backup power sources, and updated educational software.
2. The Department of Education may conduct continuous and specialized ICT-related training programs focusing on Mathematics instruction, troubleshooting skills, and digital pedagogy to improve teachers' competence and confidence.
3. Teachers may be encouraged to participate actively in professional development programs and collaborative learning activities related to ICT integration.
4. Schools may develop localized and contextualized digital learning resources that are responsive to the needs and realities of learners in geographically isolated areas.
5. Parents, stakeholders, and local government units may support schools through partnerships and resource assistance to improve access to ICT facilities and internet services.
6. Future researchers may conduct similar studies in other districts or provinces and explore additional variables such as learner performance, attitudes, and digital readiness in relation to ICT integration.
7. Programs promoting student digital literacy may be implemented to help learners maximize the benefits of ICT-supported Mathematics instruction.

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