Global Scientific JOURNALS
GSJ: Volume 13, Issue 5, May 2025, Online: ISSN 2320-9186
www.globalscientificjournal.com

Implementation of ICT on Teachers' Competence and Challeng

Authors: Hazel P. Lituañas and Dr. Estrella S. Ferenal
Institution: PHINMA Cagayan de Oro College

ABSTRACT

This study explores how the implementation of Information and Communication Technology (ICT) in education influences teachers' competencies and the challenges they face. It examines teachers' ICT use, assesses their competence and difficulties, and analyzes the relationships among these factors. Using a descriptive-correlational method, data were gathered from 348 randomly selected teachers through questionnaires covering personal characteristics, ICT competency standards, and implementation challenges. Statistical analyses included frequency, percentage, mean, standard deviation, Pearson-r, and t-test. Findings indicate that most respondents were women aged 30–34, in Teacher I positions, teaching Grade 5, with 10–14 years of experience and school-level ICT training. They showed a positive attitude toward ICT and used it actively, especially in pedagogical practices, while professional application was less emphasized. Teachers demonstrated strong communication and organizational competencies. Although overall challenges were minimal, integrating ICT into pedagogy was the most difficult area, followed by issues with infrastructure and resources. Significant relationships were found between ICT implementation and both competence and challenges. Teachers' characteristics, excluding sex, were also significantly related to their competence. The study concludes that ICT use enhances teacher competence and highlights the importance of addressing implementation challenges. It recommends upskilling programs and prioritizing organizational improvements in schools.

Keywords: *ICT implementation, competence, challenges*

Background of the Study

The implementation of technology often faces challenges such as inadequate infrastructure, high initial costs, and resistance to change from stakeholders. In many regions, especially in developing countries, limited access to reliable electricity, internet connectivity, and technical expertise hinders effective adoption. Additionally, lack of training and digital literacy among users exacerbates the problem, resulting in underutilization of available technologies. Organizational resistance, driven by fear of job displacement or disruption of traditional processes, further complicates efforts. These challenges collectively slow the realization of ICT's potential to improve efficiency, communication, and innovation in various sectors (Hernandez, 2019).

Addressing these challenges requires a multifaceted approach that includes investing in infrastructure, providing targeted training, and fostering a culture of innovation. Governments and organizations must prioritize funding for robust ICT infrastructure, such as stable internet access and reliable power supply, particularly in underserved areas (Ala-Mutka, 2019). Training programs aimed at enhancing digital literacy and equipping users with the necessary technical skills are essential to ensure effective utilization of ICT tools. Additionally, addressing organizational resistance through transparent communication, change management strategies, and the demonstration of tangible benefits can help build trust and acceptance among stakeholders. Collaborative efforts among governments, private sectors, and educational institutions can further bridge gaps and unlock ICT's transformative potential in fostering sustainable development and improved service delivery (Cabral & dela Cruz, 2020).

To conform to the standard of fast-facing trends in the educational system, teachers must be equipped with modern pedagogical and technological skills. Teachers are under pressure as they need to integrate technology into a classroom setup; many challenges are faced as they try to utilize the advantages and disadvantages of using ICT as their platform for teaching learners (Celeste & Osias, 2024). Mijares (2022) pointed out that ICT can pave the way for meaningful learning as it will allow learners to work collaboratively and can support the learners' development. ICT is essential as a learning course, but also ICT materials such as software and multimedia are used to supplement instruction, and it provides ease to teachers in tasks such as computing grades, writing reports, etc.; tasks that were to be done manually using hands before.

Despite the challenges, Philippine schools—including those in municipalities in the first legislative district—are making a real effort to include technology into their curricula. Realizing the transformative potential of technology, educators and administrators are working hard to overcome obstacles including poor infrastructure, connectivity issues,

and gaps in digital literacy. Through a range of efforts, such as technology-driven lesson plans and digital literacy programs, Philippine schools are making significant progress towards implementation of ICT in the classroom and promoting a more digitally inclusive society (Itao, 2020).

Meanwhile, the Department of Education (DepEd) achieved a significant step forward when it recognized that technology had the ability to revolutionize education. DepEd Order 78, a series of 2010, made possible the DepEd Computerization Program (DCP). Driven by a visionary perspective, this program aims to revolutionize education by carefully incorporating pertinent technologies that enhance the processes of teaching and learning. By offering computer laboratory packages to secondary schools, utilizing e-classrooms in elementary schools, providing laptops to mobile teachers, integrating ICT into the school system, and increasing the level of ICT literacy among students, teachers, and administrators, the DCP seeks to reduce the backlog of computers in public schools across the country.

Consequently, studies showed that the DCP's implementation in the country's classrooms has been advantageous for both teachers and learners. The study of Bucar (2023) indicated that the DepEd Computerization Program is highly successful and that the computer literacy of school employees is quite adequate. However, in spite of the program's advantages, there have been problems with its utilization. One of these challenges is the specialized training of the teaching personnel.

The objective of this study is to offer evidence-based perspectives and useful suggestions that will improve the learners' and teachers' educational experiences (Tria, 2020). The researcher provides the framework of this dissertation with a wealth of knowledge and a thorough understanding of the local educational environment as a school head in the municipality of Balingoan under the first legislative district of Misamis Oriental. The researcher offers a unique viewpoint on the difficulties involved in implementing ICT in the District's elementary schools because of her background as an educator. Consequently, the researcher has collaborated with other educators to explore practical approaches to address the difficulties associated with technology integration.

Literature and Related Studies

Implementation of ICT

The research emphasizes the importance of teacher training, curriculum integration, and institutional support in effectively incorporating ICT into classroom practices. Lomos et al. (2022) explores factors beyond technology that influence the successful implementation of ICT in educational settings. The study highlights the benefits of combining active learning with ICT tools to enhance student engagement and learning outcomes. Goswami et al. (2020) investigates the integration of active learning strategies within ICT education at primary and secondary levels in Bangladesh. The framework includes components such as resource allocation, financial planning, and professional development to support ICT adoption in teacher education programs. Baruch and Ungar (2019) evaluates utilization of technology in academic colleges of education, proposing a conceptual framework for effective integration.

Technology, Operations, and Concepts

The implementation of Information and Communication Technology (ICT) in education has gained increasing attention, particularly with the recent advancements in educational technology and the widespread shift to online learning due to the pandemic. Recent literature emphasizes the importance of teachers' ICT competence and the multifaceted challenges they face in effectively integrating technology into their teaching practices. Modern classrooms have seen a surge in the use of advanced technological tools such as interactive whiteboards, learning management systems (LMS), and various educational software. Interactive whiteboards and LMS like Google Classroom and Microsoft Teams have become essential for creating interactive and collaborative learning environments (Dhawan, 2020). These tools enable teachers to deliver dynamic lessons and facilitate seamless communication with students. Additionally, the use of educational software, including applications for gamification and personalized learning, has been shown to enhance student engagement and learning outcomes (Bai, Mo, & Zheng, 2021).

The successful implementation of ICT in education hinges on several operational factors, including infrastructure, professional development, and institutional support. Reliable internet connectivity and access to up-to-date hardware are critical for enabling teachers to utilize ICT tools effectively (Aboagye et al., 2021). Professional development programs have also evolved, focusing on equipping teachers with not only the technical skills but also the pedagogical strategies needed to integrate technology into their teaching (Kurt, 2019).

Social and Ethical

The implementation of Information and Communication Technology (ICT) in education brings forth significant social and ethical considerations that impact teachers' competence and the challenges they face. Socially, the digital divide remains a pervasive issue, where disparities in access to technology exacerbate educational inequalities (Van Deursen & Van Dijk, 2019). Teachers in under- resourced schools often struggle with limited access to digital tools and reliable internet, hindering their ability to develop and demonstrate ICT competence (Eickelmann & Vennemann, 2020). Ethically, concerns about data privacy and cybersecurity are paramount as schools increasingly rely on digital platforms for teaching and student assessment (Livingstone, 2018). Teachers must navigate

the complexities of protecting student data while utilizing educational technologies, which requires both technical skills and an understanding of ethical practices. Furthermore, the pervasive use of ICT in education raises issues related to screen time and its impact on students' physical and mental health, compelling teachers to balance technology use with traditional pedagogical approaches (Blum-Ross & Livingstone, 2018).

Additionally, there are ethical implications regarding the equitable treatment of students, as biases in educational software and algorithms can perpetuate existing inequalities (Baker & Hawn, 2021). Professional development for teachers must therefore encompass not only technical training but also an awareness of these social and ethical dimensions, ensuring that they can effectively integrate ICT in a manner that is inclusive, secure, and ethically responsible.

Pedagogical

The pedagogical implementation of Information and Communication Technology (ICT) in education has profound implications for teachers' competence and the challenges they encounter. Recent studies highlight that effective ICT integration requires a shift in pedagogical practices, emphasizing student-centered learning and the development of higher-order thinking skills (Kimmons & Hall, 2018). Teachers must adapt their instructional strategies to leverage the interactive and collaborative potential of digital tools, which often necessitates a departure from traditional, lecture-based approaches (Blau, Shamir-Inbal, & Avdiel, 2020). Professional development programs that focus on pedagogical frameworks like Technological Pedagogical Content Knowledge (TPACK) have proven effective in enhancing teachers' ability to integrate ICT in ways that enrich the learning experience (Kurt, 2019).

However, challenges persist, particularly in aligning ICT use with curriculum standards and assessment practices (Tondeur et al., 2020). Teachers also face difficulties in managing classroom dynamics and ensuring equitable participation when using technology (Crompton, Burke, & Gregory, 2019). Moreover, the rapid evolution of educational technologies requires continuous learning and adaptation, placing additional demands on teachers to stay current with emerging tools and pedagogical methods (Baker & Hawn, 2021). Consequently, fostering a supportive environment that encourages experimentation and provides adequate resources and training is crucial for overcoming these pedagogical challenges and enhancing teachers' ICT competence (Livingstone, 2018).

Professional

Professional development is a critical component in enhancing teachers' ICT competence, yet it poses several challenges. Recent literature underscores the necessity for ongoing, targeted professional development programs that are aligned with teachers' specific needs and the rapidly evolving technological landscape (Foulger et al., 2020). Effective professional development should encompass not only technical skills but also pedagogical strategies for implementing ICT into the curriculum. However, teachers often face obstacles such as limited time, insufficient resources, and a lack of institutional support, which hinder their ability to participate in and benefit from professional development opportunities (Kurt, 2019). Additionally, there is a growing recognition of the importance of fostering a professional learning community among teachers, where they can share experiences, collaborate, and support each other in navigating the challenges of ICT integration (Liu et al., 2022). Mentorship and peer coaching have been highlighted as effective strategies in building ICT competence, providing personalized support and practical insights (Glazer & Hannafin, 2021).

Nevertheless, disparities in access to professional development resources, especially in under-resourced schools, remain a significant barrier to equitable ICT competence among teachers (Zhang & Liu, 2019). Addressing these challenges requires a systemic approach that includes policy support, adequate funding, and a commitment to fostering a culture of continuous professional growth.

Teachers' Competence

In an investigation by Bariu et al. (2022) he demonstrated how teachers' competencies, including their confidence, skill, and capability in using ICT for instructional purposes, affect the utilization of technology in educational settings. The research emphasizes the importance of teachers' roles and positions in effectively integrating technology into their teaching practices. Similarly, Nettey et al. (2024) evaluates the challenges that basic school teachers encounter when incorporating ICT into their teaching practices. The research highlights that teachers at the basic education level often face unique obstacles, including limited resources and insufficient training, which impede effective ICT integration. In the same vein, Kennedy (2023) explores the difficulties of ICT integration in teachers' education, aiming to prescribe schemes to reduce these challenges and strengthen the integration process. The research identifies key barriers such as inadequate infrastructure, lack of training, and resistance to change among educators.

Instruction

The use of technology into the instructional components of education is essential due to its numerous advantages that significantly influence both teaching and learning. This implementation provides a multitude of customizable learning resources that may be tailored to each student's unique requirements and learning preferences.

Furthermore, educational games, films, and simulations are used by interactive elements of instructional technology to create dynamic and captivating learning experiences that capture students' interest and keep it (Baht, 2023).

One especially noteworthy advantage of technology integration is its ability to support individualized learning (Educator, Australia, 2021). This approach gives students the flexibility to customize their own learning route and proceed through the subject at their own speed to suit their individual needs. Instant feedback systems are also made feasible by technology, providing students with up-to-date knowledge on their areas of strength and growth. This customized feedback loop not only pro motes a growth mindset but also allows for more targeted and effective instruction. Furthermore, the usage of adaptive learning systems is innovative because it makes it possible to dynamically customize the content to match each learner's unique requirements and skills, creating a more personalized and successful learning environment. The comprehensive study conducted by Cortazar et al. (2021) claimed that the use of technology fosters a learning environment where students are empowered to take charge of their education by giving them access to an unparalleled amount of knowledge. Students can hone their critical thinking skills and delve further into subjects that interest them thanks to this expanded access. It encourages independent study as well. Consequently, technology develops a sense of resourcefulness and intellectual curiosity as well as self-directed inquiry.

Organization

The term organizational use of technology implementation in education refers to the systematic process of developing and arranging lesson plans for in-class instruction along with organizing and managing student data. The way educational institutions operate has radically changed as a result of this method, which has raised general instruction standards, productivity, and data-driven decision-making (Tomaro, 2018). According to Harell and Bynum (2018), the effective management of data in educational contexts depends on technology integration. It provides a rigorous and straightforward approach to managing and organizing student data, improving the overall effectiveness and efficiency of educational processes. The key to this ability is Student Information Systems, which have evolved into essential tools in modern teaching. With this comprehensive data management tool, educators may gain invaluable insights into each student's academic journey. It enables teachers and administrators to monitor students' progress, identify areas for improvement, and adapt lessons to meet the requirements of each individual student.

Because of this, schools are better able to cater to the unique learning requirements of each student, which ultimately raises the standard and effectiveness of instruction in the classroom. The significance of technology implementation in fostering improved data management and, consequently, improved learning outcomes is underscored by the research conducted by Harrell and Bynum. Nasir (2023) highlighted a critical facet of technology implementation, namely the way it enables educators to engage in the process of creating digital lesson plans. By using the power of technology, educators may design lesson plans successfully and efficiently with the help of this new way.

Communication

Technology implementation has had a big impact on education's communication components. It has fundamentally altered how members of the educational ecosystem—students, instructors, and other stakeholders—interact, collaborate, and share information (Josue et al., 2023). Wang (2021) also discussed how implementing technology enhances communication and collaboration. The implementation of technology in education facilitates collaboration among students, professors, and other stakeholders. Digital technologies like online discussion boards, video conferencing, and collaboration software allow for real-time contact across geographic borders. Group projects, peer-to-peer learning, and active participation are made possible by this enhanced communication, which results in a more lively and engaging learning environment.

In addition, a study conducted in 2021 by Gilmore and Deos emphasized the significance of using technology into education in order to increase its global reach. Teachers and students can broaden their conversational horizons by using technology to communicate across geographical boundaries. Through the use of technology, students from all over the world can take part in an intricate web of communication connections. Students can engage with peers and subject matter specialists from different cultural backgrounds through online forums, virtual exchanges, and collaborative learning settings. This fosters a deeper understanding of diverse cultures as well as global viewpoints.

Furthermore, it has been demonstrated that incorporating technology into educational settings can significantly increase the effectiveness of stakeholder participation. Ley et al. (2021) found that parents and administrators would be among the educational stakeholders who will be most affected by the incorporation of technology. Through the use of technology, these crucial collaborators in the educational process can remain actively involved in their children's academic progress. Parents that make use of learning management system capabilities can visit dedicated portals that provide them with immediate access to their child's performance data. This accessibility makes it easier to communicate with instructors, which results in more informed and productive conversations. As a result, by actively supporting their child's educational path, parents are better equipped to promote a collaborative and educated approach.

Creation

Technology is very significant in schooling since it encourages innovation. When technology is properly integrated into teaching and learning, students' creativity is spurred and new chances for innovation are created. In their research, Ghavifekr and Rosdy (2018) made an intriguing discovery. The study found that using technology in the classroom can significantly boost student creativity. using the use of technology, teachers may design individualized and interactive learning experiences using a wealth of tools and resources. As a result, teachers who effectively incorporated technology into their lesson plans saw exceptional outcomes, including increased collaboration among students, increased student engagement, and the freedom to experiment with different teaching philosophies.

Moreover, the revolutionary potential of technology implementation in the classroom was highlighted by Herodotou et al.'s thorough analysis from 2019. The study's findings emphasized how teachers may utilize cutting-edge teaching techniques thanks to technology. Consequently, teachers who used technology into their lesson plans to the fullest extent observed significant gains in their students' ability to think critically, solve problems, and be creative throughout the learning process. This highlights the important role that technology plays in both innovative instruction and the development of students.

Thus, teachers who creatively integrated technology were more likely to provide students with opportunities for self-expression and inquiry, according to Hartman and Townsend's (2019) study. In these classes, students also demonstrated higher levels of enthusiasm, motivation, and innovative thought. An additional significant study underscored the significance of technology in empowering teachers to cater to the requirements of pupils with diverse learning styles and abilities. The study's findings demonstrated that teachers' ability to adapt education to each student's unique needs increased significantly when they skillfully included technology into their lesson plans. Consequently, this adaptability promoted the creation of more creative and friendly learning environments (Henebery, 2022).

Challenges

Atabek (2019) investigates the obstacles to technology integration in education, focusing on the opinions of professionals selected by the Turkish Ministry of National Education. The research identifies major challenges, including insufficient in-service and pre-service training, lack of content support, inadequate incentive systems, and deficiencies in physical and technological infrastructure. Notably, the study found that the novelty of technologies compared to older ones was not considered a significant obstacle to technology integration.

Prakash (2022) explores the primary challenges in implementing ICTs into education, highlighting issues such as teachers' lack of knowledge and skills, inadequate infrastructure, and cultural challenges. The study emphasizes that diversities of culture and language can impede the effective use of ICT in education, particularly when educational software is predominantly available in English. Habibu et al. (2022) examines the challenges faced by teachers in Uganda when using ICT in teaching and learning. The study identifies issues such as low internet connectivity, lack of proper ICT skills, and unreliable electricity supply as significant barriers to effective ICT integration in education.

Infrastructure and Resources

This change is not without its challenges. Research titled Prospective Teachers' Perceptions of constraints to Technology Implementation in Education (DOI.ORG, 2019) cited a number of internal and external constraints, including a lack of cash or a budget, a lack of equipment, a lack of expertise, or a lack of time. Additionally, supporting this claim is Adarkwah (2020). The results of the survey showed that students cited a lack of electricity, internet connection, and ICT gear as some of the barriers to online learning. In addition, as Dublar (2023) noted, incorporating technology into the classroom presents a variety of infrastructure and resource-related challenges. These challenges manifest as formidable barriers and include things like not having the required technology, software, or internet connectivity. These essential components are lacking, which makes it challenging to integrate digital tools into the classroom seamlessly in addition to making it challenging to use technology successfully.

Furthermore, as said by Samed et al., (2022), educators have recognized a number of significant obstacles that function as powerful barriers to the successful integration of ICT into their teaching methods. These difficulties come in various forms, but the most common ones include poor internet access, the disruptive effects of power outages (also known as load shedding), infrastructure flaws, a lack of prior experience with online learning, and the pressing need for longer-term training programs.

Training and Professional Development

UNESCO's 2023 conclusions emphasized that one of the main obstacles to the incorporation of technology in the classroom is the problem of ICT and Teacher Professional Development. The study provides backing for UNESCO's assessment and underscores the significance of providing teachers with opportunities for specialized professional development to enhance their proficiency in implementing ICT in the classroom. Furthermore, as noted by Cebi (2019), educators exhibited a favorable disposition about the integration of technology into language teaching. Nonetheless, the respondents did point up a number of challenges, including a lack of prior experience in incorporating technology into language instruction, limited access to tools and resources in the classroom, inadequate support

networks, and a dearth of training opportunities. It was more difficult for them to employ technology to enhance language training because of all of these factors.

Professional development is vital and cannot be overstated in the realm of technology integration, as Rosales (2021) pointed out. For educators to successfully navigate the rapidly evolving landscape of educational technology, it continues to be an essential qualification. To surmount the persistent challenges posed by the digital divide, a steadfast commitment to ongoing professional development becomes imperative. These courses provide educators with a dynamic learning environment and the resources they need to successfully incorporate technology into the classroom. This framework places a strong emphasis on training as the starting point for ongoing, pertinent professional development. Its significance cannot be overstated, as it fosters an environment conducive to the success of both teachers and students and has a major influence on the overall efficacy of technology integration programs.

Equity and Access

In addition to the aforementioned variables, a comprehensive study conducted by Tomaro (2018) brought to light the important challenges associated with the implementation of Information and Communication Technology (ICT) in the educational setting, with a particular emphasis on issues of equity and accessibility. This study made clear the many obstacles that appear when technology is used, especially when it comes to online education. The study's findings illustrated the challenges associated with technology resources and network connectivity. Together, these significant limitations hinder the widespread and effective use of ICT tools.

In view of the equity and access issue, more clarification on Rombaoa's (2019) findings about the financial burden of ICT implementation on Filipino families—especially those whose children attend public schools—is essential. Rombaoa's research sheds light on a significant facet of the challenges related to ICT implementation. Consequently, part of the implementation process may involve funding training programs to acquire the competencies needed for successful ICT implementation. Furthermore, in order to ensure that students receive the best possible education, teachers may need to replace or purchase new hardware and software.

However, families and students may experience severe financial difficulty. The degree to which various socioeconomic groups have access to technology and the internet varies. When technology is used in the classroom, some students can be at a disadvantage because they don't have access to the necessary devices or stable internet connections at home. The digital divide exacerbates the existing gaps in educational chances by potentially making it harder for students to obtain and benefit from technology-rich learning opportunities (Rombaoa, 2019).

Pedagogical Implementation

Numerous studies have outlined the various barriers that impede the pedagogical implementation of ICT, which is an essential aspect of education. A notable study by Nisa et al. (2020) brought attention to one such problem by demonstrating how teachers commonly find it difficult to link technology with precise learning objectives and outcomes. To ensure that ICT implementation enhances educational goals in an effective way, a rigorous alignment procedure is required. Achieving these objectives is a complicated task since different educational environments may have quite different standards for the application and effectiveness of technology tools.

Furthermore, Rebucas and Dizon (2020) emphasized the substantial challenges educators have when attempting to seamlessly implement Information and Communication Technology into their pedagogical approaches. Their findings brought to light the difficulties teachers encounter in trying to achieve a balance between conventional teaching techniques and technology—a process that often proves to be difficult. Additionally, their results showed that an excessive dependence on technology could compromise fundamental educational principles, emphasizing the need for a cautious balance between the two approaches.

Despite these challenges, studies have demonstrated the many advantages of ICT implementation in the classroom, especially for the process of teaching and learning. Actually, incorporating ICT increases student involvement, according to a relevant study by Anderson et al. (2021). This study highlights how Information and Communication Technology tools can be deliberately included into the curriculum to boost student participation and create a more dynamic and engaging learning environment. The study was conducted at a secondary school. The study found that ICT implementation made it easier to create customized learning experiences that could accommodate different learning preferences and styles. Consequently, this improved student involvement and strengthened their sense of agency over their education.

Statement of the Problem

The study attempted to determine the level on the implementation of ICT on teacher's competence and challenges in the Division of Misamis Oriental during the School Year 2024-2025. Specifically, this study sought to answer to the following questions:

1. How are the respondents characterized in terms of age, sex, position, grade level taught, teaching experience, seminars/ trainings attended on technology, and attitude towards the implementation of ICT?
2. What is the respondents' level of the implementation of ICT in terms of technology, operations, and concepts, social and ethical, pedagogical, and professional?

3. What is the level of teachers' competence with regard to instruction, organization, communication, and creation?
4. What is the level of teachers' challenges considering infrastructure and resources, training and professional development, equity and access, and pedagogical integration?
5. Is there a significant relationship between the respondents' implementation of ICT and their competence?
6. Is there a significant relationship between the respondents' implementation of ICT and their challenges?
7. Is there a significant difference in the teachers' competence when grouped according to their characteristics?

Theoretical Framework

This study is anchored on the Diffusion of Innovations Theory proposed by Rogers (2003), which explains how new ideas and technologies spread within social systems. The theory identifies four key elements influencing the diffusion process: the innovation itself, communication channels, time, and the social system. Rogers (2003) categorized adopters into five groups based on their willingness to adopt innovations: innovators, early adopters, early majority, late majority, and laggards. Innovators are venturesome and willing to take risks, while early adopters are respected opinion leaders who cautiously embrace new ideas. The early majority adopts sooner than the average individual but after careful deliberation, whereas the late majority is skeptical and only adopts once most others have done so. Laggards, who focus on traditions, are the last to adopt innovations (Alrahmi et al., 2019).

This categorization provides insights into the varied levels of ICT adoption among teachers in the Division of Misamis Oriental, helping identify tailored interventions to address challenges in adoption. The theory outlines a five-step innovation-decision process: knowledge, persuasion, decision, implementation, and confirmation. In the knowledge stage, individuals become aware of an innovation and understand its function. During persuasion, they form favorable or unfavorable attitudes toward the innovation. The decision stage involves activities leading to adopting or rejecting the innovation, followed by implementation, where the innovation is put into use. Finally, in the confirmation stage, individuals seek reinforcement for their decision (Modgil, et al., 2022).

Scope and Limitations

This study focused on the implementation of ICT on teachers' competence and challenges in the Division of Misamis Oriental, School Year 2024 – 2025. The respondents are the three hundred forty-eight grade 4, 5 and 6 teachers in the medium and big schools in the aforesaid division. The independent variables are limited to the implementation of ICT in terms of operations, and concepts, social and ethical, pedagogical, and professional. The dependent variables are also limited to the teachers' competence and challenges. The teachers' competence on instruction, organization, communication, and creation, and their challenges on infrastructure and resources, training and professional development, equity and access, and pedagogical integration. Furthermore, moderating variables are also limited to the respondents' age, sex, position, grade level taught, related training/ seminars attended on ICT, and attitude towards the implementation of ICT.

METHODOLOGY

Research Design

This study made use of descriptive – correlational method of research used to collect organized numerical data from the teacher participants. The descriptive- correlational method of research is particularly suitable for studies aiming to examine the relationships between variables while providing a clear snapshot of the current state of the phenomena under investigation. In this study, the method is used to collect organized numerical data from teacher participants to assess their competencies in implementing ICT and to identify the challenges they face. This approach is justified by its ability to systematically describe the existing conditions and to explore correlations between specific variables, such as teachers' technological proficiency, pedagogical strategies, and the extent of ICT integration.

Study Setting

The study was conducted among the schools that belong to the medium and big school categories in the Division of Misamis Oriental. There are three hundred fifty-one (351) schools and 34 districts in the Division of Misamis Oriental and a total of four thousand one hundred fifty (4,150) public elementary school teachers. Misamis Oriental (Cebuano: Sidlakang Misamis; Tagalog: Silangang Misamis), officially the Province of Misamis Oriental, is a province located in the region of Northern Mindanao in the Philippines.

Research Respondents and Sampling Technique

The respondents of the study were the three hundred forty-eight grade 4, 5 and 6 teachers working in the first and second legislative districts of the Division of Misamis Oriental in the School Year 2024–2025. These educators were selected to provide a comprehensive understanding of the implementation of ICT in the elementary schools within the division of Misamis Oriental, ensuring a representative sample of teachers across the districts. Table A

shows the distribution of respondents by district. The sampling technique used in this study is stratified random sampling, where the population is divided into distinct subgroups or strata, in this case, the various districts within the Division of Misamis Oriental. Each district's population is listed in the provided table, and respondents were randomly selected from each district, ensuring proportional representation across both larger and smaller districts. Stratified sampling allows for a more accurate reflection of the entire population by ensuring that each district is adequately represented, thereby capturing the diversity of the educational landscape in the region.

Research Instrument

The instrument used in gathering the necessary data was a questionnaire of three parts. The first part of the questionnaire is meant to gauge the level of implementation of ICT based on National ICT Competency Standards from the study of Mijares (2022) entitled Teachers' Information and Communication Technology Competencies: Basis for a Competency – based Training Program. This section is broken down into four separate subtopics on technology, operations, and concepts, social and ethical, pedagogical, and professional. The second part of the instrument aims to measure the level of competence anchoring to DepEd Order 78 s. 2010 from the study of Celeste and Osias (2024) entitled Challenges and Implementation of Technology Integration: Basis for Enhanced Instructional Program. This section is organized around four (4) main subtopics on instruction, organization, communication, and creation. The third part of the instrument aims to measure the level of challenges encountered by the respondents in terms of ICT from the study of Celeste and Osias (2024) entitled Challenges and Implementation of Technology Integration: Basis for Enhanced Instructional Program. This section is organized around four main subtopics on infrastructure and resources, training and professional development, equity and access, and pedagogical integration.

Statistical Treatment of Data

Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to describe the variables in the study. Furthermore, the study employed inferential statistics, namely the Pearson Correlation Coefficient, or Pearson-r, to determine the relationship between the respondents' implementation of ICT and their competencies as well as their challenges. Moreover, t-test and F- test were used to test the significant difference in the respondents' implementation of ICT when grouped according to their characteristics.

Ethical Considerations

To ensure the highest standards of research integrity, a variety of ethical considerations were closely adhered to when conducting research on implementation of ICT in the educational context of the First and Second Legislative District of Misamis Oriental. The principle of informed consent was the most crucial of these. Every study participant, including instructors and other interested parties, willingly agreed with full knowledge of the purpose, role, and handling of their personal data. Prior to their participation, participants were provided with a clear and comprehensive informed consent form that detailed the study's objectives, data collection methods, and how their data would be implemented. Furthermore, obtaining approval from the Division Office of Misamis Oriental, which oversees educational concerns in the designated study area, was a crucial first step in ensuring compliance with institutional policies and procedures while respecting the authority of educational leaders. In addition, great care was taken to safeguard the privacy and confidentiality of the participants. To prevent any unintentional disclosure of identity, all information was securely stored, and comments and experiences were reported using codes or pseudonyms. Participants were provided with complete information on how their data was collected, stored, and used, along with a guarantee that it would only be utilized for research purposes and not for profit or any other unethical purposes. It was crucial to adhere to data protection laws and regulations to ensure ethical compliance throughout the study. Maintaining objectivity and impartiality of the research was also crucial. The researchers of the study took great care to ensure that the results were presented in an unbiased, truthful, and impartial manner by not advocating or promoting any particular technology or methodology. Participants in the research also had the opportunity to offer feedback on the study's findings. Once the results became available, they were shared with the community in an understandable and direct manner, promoting a collaborative and informed learning environment.

RESULTS AND DISCUSSION

Problem 1. How are the respondents characterized in terms of age, sex, position, grade level taught, teaching experience, seminars/ trainings attended on ICT, and attitude towards ICT?

Table 1
Distribution of Respondents' Characteristics

Variables	Category	Frequency	Percentage
Age	50 years old and above	36	10.34
	45 – 49 years old	42	12.07
	40 – 44 years old	53	15.23

	35 – 39 years old	59	16.95
	30 – 34 years old	78	22.41
	25 – 29 years old	49	14.08
	24 years old and below	31	8.91
	Total	**348**	**100.00**
Sex	Male	58	16.67
	Female	290	83.33
	Total	**348**	**100.00**
Position	Master Teacher II	8	2.30
	Master Teacher I	15	4.31
	Teacher III	78	22.41
	Teacher II	69	19.83
	Teacher I	178	51.15
	Total	**348**	**100.00**
Grade Level Taught	Grade 6	82	23.56
	Grade 5	145	41.67
	Grade 4	121	34.77
	Total	**348**	**100.00**
Teaching Experience	30 years and above	29	8.33
	25 – 29 years	33	9.48
	20 – 24 years	47	13.51
	15 – 19 years	34	9.77
	10 – 14 years	113	32.47
	9 years and below	92	26.44
	Total	**348**	**100.00**
Seminars/ Trainings Attended on ICT	International	20	5.75
	National	31	8.91
	Regional	36	10.34
	Division	68	19.54
	District	86	24.71
	School	107	30.75
	Total	**348**	**100.00**

Table 1 provides a detailed breakdown of the respondents' characteristics, including age, sex, position, grade level taught, teaching experience, and seminars/trainings attended on ICT. Each category reveals significant insights into the demographic profiles of the participants, helping to contextualize the study's findings regarding ICT integration.

In terms of age, the highest frequency in the age distribution belongs to the **30–34-year-old category**, which constitutes **78 (22.41%)** respondents. This emphasizes that a significant portion of the respondents are in their early 30s, a period often associated with professional maturity and the capability to balance innovative teaching practices with experience. Teachers within this age range are typically well-adjusted to the demands of their role, having gained some years of classroom experience while still being open to innovative practices. The focus on this age group highlights a workforce actively contributing to the education system's evolving needs. Policies promoting continuous professional development, leadership training, and digital literacy programs would be well-suited for this demographic, ensuring sustained innovation and engagement.

Studies like Sánchez et al. (2020) suggest that educators in their 30s are at the forefront of adapting to technological advancements and integrating these into their teaching methods, given their exposure to both traditional and digital pedagogies. This age group's prominence may indicate hiring trends favoring mid- career professionals who bring both stability and adaptability. It also suggests that this cohort is likely to take on more responsibilities, including mentorship roles, as they navigate their career progression.

Conversely, the lowest frequency is observed among those aged **24 years old and below,** comprising only **31 (8.91%)** respondents. This low percentage underscores the minimal presence of novice teachers, which might reflect the limited entry of fresh graduates into the teaching workforce. Attracting younger professionals requires systemic reforms, including competitive entry-level compensation and structured induction programs. Their inclusion is critical for infusing fresh energy and sustaining generational diversity within the teaching workforce.

Research by Hernandez (2019) notes that new graduates often struggle to transition into the teaching workforce without sufficient mentorship or professional support. Young teachers, while scarce, are valuable for their ability to bring fresh ideas and technological skills to the classroom. However, their limited presence could hinder the integration of new teaching methodologies, particularly those requiring a high level of digital fluency.

In terms of sex, the highest frequency are **females,** accounting for **290 (83.33%)** respondents. The overwhelming majority of female educators highlights the gendered nature of the teaching profession, particularly in elementary education, where nurturing roles are traditionally emphasized. This suggests that women play a pivotal role in nurturing foundational education. The implications of this gender distribution are profound, as it might influence the emotional and empathetic teaching styles prevalent in the classroom. While the high representation of female teachers enhances the social-emotional dynamics of classrooms, it also underscores the importance of addressing gender diversity. Introducing programs to recruit and retain male teachers can promote varied teaching approaches and provide students with a broader range of role models.

This is consistent with global trends, as highlighted by *UNESCO (2020),* which attributes this to the association of teaching with nurturing and caregiving roles—qualities traditionally linked to women. Female educators are often seen as more empathetic and patient, making them well-suited for the demands of teaching, especially in elementary grades.

On the other hand, the lowest frequency is for **males** with **58 (16.67%)** respondents. This finding points to a pronounced predominance of females in the field, reflecting a persistent trend observed in education across various contexts. The lack of male representation carries important implications, particularly for the diversity and inclusivity of the teaching workforce. Efforts to attract more men into teaching could involve breaking down gender stereotypes, offering scholarships, or creating campaigns that highlight the importance of male educators. A balanced gender representation fosters inclusivity and diverse classroom experiences.

Research, such as the study by Stewart et al. (2020), emphasizes that a limited presence of male educators may reduce the variety of role models available to students. This is especially critical for male learners, who could greatly benefit from mentorship, guidance, and support provided by male teachers. The underrepresentation of men in teaching might inadvertently perpetuate traditional gender roles, limiting students' perspectives on professional diversity.

In terms of position, the highest frequency among positions is held by **Teacher I**, making up **178 (51.15%)** respondents. This indicates that the majority of respondents are entry-level or early-career teachers. Such a composition might reflect the structure of the teaching workforce, where a substantial proportion of educators occupy the lower ranks. Providing Teacher I educators with clear pathways for advancement and access to professional development programs can improve retention rates and motivate them to pursue higher ranks. According to Garcia and Weiss (2019), teachers in this category often face challenges such as high workloads and limited opportunities for professional advancement. This finding suggests a need for policies that address career progression and provide professional development for early-career teachers.

In contrast, **Master Teacher II** represents the lowest frequency, with only **8 (2.30%)** respondents. This scarcity could be attributed to the stringent requirements and qualifications necessary to attain this rank. The limited representation of Master Teacher II respondents might also suggest a need to create clearer pathways for educators to achieve higher positions, ensuring that experience and expertise are adequately recognized. Additionally, the low number of Master Teacher II respondents may indicate a lack of professional development opportunities or mentorship programs that support teachers in advancing to higher ranks. Addressing these barriers could encourage more educators to aspire for career progression, ultimately strengthening the overall teaching workforce. These roles are typically reserved for educators with extensive experience and advanced credentials, as emphasized by Rivera *(2019)***.** The scarcity of Master Teachers may also indicate limited opportunities for career progression within the system.

When considering the grade level taught, the highest frequency is observed in **Grade 5,** which accounts for **145 (41.67%)** respondents, suggesting its significance as a transitional stage in elementary education. Providing targeted support and resources for Grade 5 teachers, such as training in differentiated instruction and classroom management, can enhance their effectiveness in meeting students' needs. Research by Delos Santos et. al (2023) points out that intermediate grades are critical for preparing students for higher-level learning, and the focus on Grade 5 educators might reflect the importance of these transitional years.

The lowest frequency is in **Grade 6**, with **82 (23.56%)** respondents. While this grade level still represents a substantial portion, its lower representation compared to Grade 4 and Grade 5 might imply differences in teaching assignment distribution or curriculum demands. Focusing on the professional development of Grade 6 teachers, particularly in areas like student assessment and transition support, is crucial for ensuring students' readiness for the next stage of education. This lower representation may also suggest variations in class sizes, subject specialization, or

staffing allocations within schools. Providing targeted training and resources for Grade 6 teachers can further enhance their effectiveness in preparing students for higher academic levels. As noted by Rambo-Hernandez et. al (2019), Grade 6 is a pivotal year for elementary education, as students prepare for secondary school. The relatively lower number of Grade 6 teachers could necessitate strategies to ensure adequate support for this critical stage of education.

In terms of teaching experience, the data revealed that **113 (32.47%)** belonged to **10-14 years.** This indicates a workforce that is experienced yet actively engaged in their careers. Schools should leverage the expertise of this group by involving them in mentorship programs and leadership roles, fostering a culture of collaboration and professional growth. Additionally, their experience positions them well to serve as role models for early-career teachers, helping to bridge knowledge gaps and enhance instructional quality. Providing continuous professional development opportunities tailored to their expertise can further empower them to take on more significant responsibilities within the educational system.

Teachers within this age range often strike a balance between the benefits of their accumulated professional experience and an openness to adopting innovative practices and methodologies. As Sánchez et al. (2020) observe, educators in this stage of their careers are uniquely positioned to combine tried-and-true teaching strategies with a readiness to embrace new approaches, fostering a dynamic and adaptive learning environment.

In contrast, **29 (8.33%)** belonged to **30 years and above.** Only a small percentage attended international-level ICT seminars, reflecting limited access to global training opportunities. Increasing access to international training through scholarships or virtual platforms can help teachers gain valuable insights and enhance their competencies. This limited participation in international ICT seminars may also highlight barriers such as funding constraints, eligibility requirements, or a lack of awareness about available opportunities. Expanding institutional support and promoting global networking initiatives can equip teachers with advanced skills, fostering innovation in classroom practices.

Hernandez (2020) underscores the critical importance of retaining experienced educators, highlighting their profound contributions to the educational ecosystem. Their deep institutional knowledge, coupled with their ability to mentor and guide less experienced colleagues, serves as a cornerstone for maintaining teaching excellence and fostering professional growth within schools. These seasoned educators not only provide stability and continuity but also play a vital role in shaping a collaborative and supportive learning environment.

For seminar / trainings attended on ICT, it is revealed that the highest frequency is for **school level** with **107 (30.75%),** reflecting the accessibility of such programs. Expanding school-level ICT training programs can ensure that all teachers are equipped to integrate technology effectively into their classrooms. However, reliance on school-level training alone may limit exposure to more advanced technological trends and best practices. Encouraging participation in regional, national, and international ICT seminars can broaden teachers' knowledge, enhance digital competencies, and promote innovative teaching strategies.

Garcia (2021) emphasizes that school-based training is uniquely effective due to its tailored approach, which addresses the specific needs and challenges faced by educators within their particular contexts. This customization ensures that the training is both practical and immediately applicable, enabling teachers to utilize new strategies directly into their classrooms. By focusing on context-specific solutions, school-based training fosters professional growth while enhancing the overall teaching and learning experience.

Conversely, **20 (5.75%)** is the **lowest frequency,** reflecting limited access to **international training** opportunities. This highlights a broader issue within professional development systems, where opportunities for global exposure and learning remain limited for many. Such training often provides critical insights into innovative teaching practices, diverse educational strategies, and cross-cultural competencies, which are essential in today's interconnected world. The low participation rate suggests that either these opportunities are not widely available, or barriers such as financial constraints, institutional support, or lack of awareness hinder access. This limitation not only affects individual educators' professional growth but may also have a ripple effect on the overall quality of education, as exposure to international practices is instrumental in enhancing local teaching methodologies. Observationally, this points to a need for greater investment in creating equitable access to global training programs, ensuring that educators at all levels can benefit from a broader spectrum of professional learning experiences.

Increasing access to international training through scholarships or virtual platforms can help teachers gain valuable insights and enhance their competencies. Rivera (2019) emphasizes that international training opportunities offer educators valuable exposure to global best practices, enhancing their professional development and enriching their teaching approaches. However, such opportunities are often hindered by significant challenges, including limited funding, logistical complexities, and access disparities. These constraints can prevent many educators from fully benefiting from these experiences, underscoring the need for more accessible and equitable support systems to facilitate participation in international training programs.

Table 2
Distribution of the Respondents' Attitude towards the Implementation of Information and Communication Technology

Indicator	Mean	SD	Description

I enjoy engaging in computer training programs.	3.01	0.69	Agree
I am open-minded and receptive to new technologies introduced in training.	3.20	0.72	Agree
I feel a sense of satisfaction when engaging in computer training.	2.99	0.69	Agree
I have a positive attitude towards computer training.	2.25	0.62	Disagree
I view computer upskilling as essential for professional development.	3.23	0.76	Agree
I find it challenging to enjoy learning about computers.	3.56	0.89	Strongly Agree
I lack the motivation to attend computer training programs.	3.17	0.74	Agree
I have limited interest in improving my computer knowledge.	3.53	0.86	Strongly Agree
I find learning about computers challenging.	2.23	0.53	Disagree
I feel that computer upskilling training is unproductive.	2.01	0.48	Disagree
Overall	**2.92**	**0.70**	**Agree**

Legend: 3.26-4.00 Strongly Agree / Very Positive; 2.51-3.25 Agree / Positive; 1.76-2.50 Disagree / Negative; 1.00-1.75 Strongly Disagree/ Very Negative

Table 2 provides the respondents' attitudes toward the implementation of information and communication technology with an overall mean of **2.92 (SD=0.70)** described and interpreted as **Agree.** This means that most respondents generally have a positive attitude toward computer upskilling. This indicates a recognition of its value and relevance in their professional growth. However, the mean also reveals slight variations in the respondents' levels of agreement across specific indicators, showing a mix of enthusiasm and reservations about computer training. This shows that while educators value computer upskilling training and recognize its importance, ongoing support and motivation are essential to address challenges and maximize its benefits. Institutional support, such as well-structured ICT training programs and follow-ups, can bridge the gaps identified in this study and empower educators to excel in an increasingly technology-driven educational landscape. This aligns with studies on teacher professional development on the findings of Orbeta et al. (2019), which highlight that while educators acknowledge the importance of technology, practical challenges like accessibility, workload, and motivation can influence their attitudes. The data suggests that respondents are aware of the benefits of upskilling but may face hurdles in fully embracing it.

The indicator, **I find it challenging to enjoy learning about computers** has a mean of **3.56 (SD=0.89)** describe **Strongly Agree** and interpreted as **Strongly Agree**. This means that while educators recognize the importance of computer upskilling, they struggle with enjoyment and engagement. This could stem from outdated training methods, lack of personalized learning pathways, or the perception of technology as a mandatory rather than empowering tool. This implies that schools may require rethinking of the INSET and SLAC sessions design, such as gamified learning, peer mentoring, or other ICT-based approach to boost motivation and relevance. DepEd's advocacy research as cited in DepEd Order No. 78, s. 2019, underscores the importance of building ICT competencies among teachers to improve instruction quality and align with 21st-century learning demands. The readiness among educators to grow professionally and incorporate technology into their practices is vital for integrating ICT effectively into teaching and learning.

In contrast, the lowest mean indicator, **I feel that computer upskilling training is unproductive** has a mean of **2.01 (SD=0.48)** describe and interpreted as **Disagree.** This means that this statement is a promising sign, indicating widespread belief in the utility of ICT training. However, this further suggests lingering skepticism among some respondents and that potential reasons may include past experiences with poorly implemented training or a lack of visible outcomes after the training. Schools should emphasize tangible benefits like showcasing success stories, linking training to career advancement, and ensuring follow-up support to translate skills into classroom practice. As expressed in the research of Rodriguez et al. (2019), which highlights that educators' positive perceptions of ICT training significantly impact their willingness to engage in continuous professional development. The data also supports DepEd's directive to ensure that teachers receive adequate ICT-related training to enhance their confidence and effectiveness in integrating technology into their classrooms.

Problem 2. What is the respondents' level of implementation of ICT in terms of technology, operations, and concepts, social and ethical, pedagogical, and professional?

Table 3
Summary of the Respondents' Level of the Implementation of ICT

Variables	Mean	SD	Interpretation
Technology, Operations, and Concepts	2.76	0.64	Implemented
Social and Ethical	3.01	0.68	Implemented
Pedagogical	3.07	0.70	Implemented
Professional	2.70	0.66	Implemented
Overall	**2.89**	**0.67**	**Implemented**

Legend: 3.26-4.00 Strongly Agree / Highly Implemented 1.76-2.50 Disagree / Slightly Implemented 2.51-3.25 Agree / Implemented 1.00-1.75 Strongly Disagree/ Not Implemented

Table 3 outlines a summary of the respondents' **level of implementation of ICT across four areas:** technology, operations, and concepts; social and ethical; pedagogical; and professional aspects with an overall mean of **2.89 (SD=0.67),** described and interpreted as **implemented.** This means that respondents integrate ICT moderately in their roles but do not fully maximize its potential. The variability in scores suggests that while some respondents demonstrate strong proficiency in specific ICT areas, others may face challenges due to gaps in training or access to resources. From the researchers' perspective, these findings reflect a general awareness of ICT's value in education, as emphasized in DepEd's ICT in Education Roadmap. However, they also highlight the need for more comprehensive training programs to ensure consistent implementation across all areas.

The highest variable, **Pedagogical** got a mean of **3.07 (SD=0.70),** interpreted as **implemented,** reflects the respondents' relatively higher proficiency in using ICT to support teaching and learning processes. This suggests that teachers are more comfortable integrating technology into instructional activities, such as lesson planning, resource sharing, and engaging students through multimedia tools. Researchers observed that this aligns with DepEd Order No. 78, s. 2019, which prioritizes the use of ICT to enhance classroom teaching and learning experiences. Additionally, studies like those of Boholano (2019) and Cabero-Almenara and Barroso-Osuna (2019) show that ICT integration in pedagogy significantly improves student engagement and learning outcomes. The relatively high score in this domain indicates a strong foundation that can be further built upon with targeted professional development, focusing on advanced tools and applications.

On the other hand, the lowest variable, **Professional** got a mean of **2.70 (SD=0.66),** described and interpreted as **implemented,** highlights respondents' challenges in using ICT for professional tasks, such as research, collaboration, and content management. This finding suggests that while teachers recognize the importance of ICT in professional growth, they may lack the necessary skills, tools, or support to fully utilize these practices. Researchers noted that this is consistent with findings by Dela Cruz et al. (2020), which emphasize that many teachers feel underprepared for more advanced ICT applications, such as conducting and publishing research or actively engaging in professional learning communities online. DepEd Memo No. 72, s. 2019, also acknowledges the need for strengthening professional ICT skills among educators to maximize its impact. The low score in this domain underscores the need for more structured training and resource allocation to empower teachers to effectively use ICT in their professional roles.

Problem 3. What is the level of teachers' competence with regard to instruction, organization, communication, and creation?

Table 4
Summary of the level of Teachers' Competence

Variables	Mean	SD	Interpretation
Instruction	3.20	0.73	Competent
Organization	3.00	0.68	Competent
Communication	3.41	0.75	Highly Competent
Creation	3.24	0.80	Competent
Overall	**3.21**	**0.74**	**Competent**

Legend: 3.26-4.00 At all Times / Highly Competent 1.76-2.50 Sometimes / Slightly Competent 2.51-3.25 Most of the Time / Competent 1.00-1.75 Never / Not Competent

Table 4 summarizes the **level of teachers' competence across four key areas:** instruction, organization, communication, and creation with an overall mean score of **3.21 (SD=0.74)** described and interpreted as **competent**. This means that teachers frequently demonstrate competence in implementing ICT in various aspects of their professional tasks. However, the variability across the domains indicates that while some competencies, like

communication, are more developed, others, such as organization, may require additional attention. From a researcher's perspective, these results signify a positive trend in ICT implementation but highlight areas for further development. This observation aligns with DepEd Order No. 78, s. 2019, which emphasizes equipping educators with ICT skills to meet modern teaching demands effectively. The findings suggest that continuous professional development is essential to enhance teachers' overall ICT proficiency.

The highest variable is **Communication** with a mean of **3.41, (SD=0.75)** described and interpreted as **highly competent**. This means that teachers are highly proficient in using ICT for communication purposes, such as collaborating with colleagues, engaging students, and interacting with parents. This competency demonstrates teachers' reliance on digital communication tools, such as email, messaging platforms, and learning management systems, particularly in response to the demands of remote and blended learning setups. Researchers observed that this strong communication capability reflects the critical role of ICT in building connections within the school community. Studies like Boholano (2019) found that communication-enhancing tools improve teachers' ability to foster collaboration, improve instructional delivery, and support student engagement. This finding underscores that teachers recognize the transformative potential of ICT in establishing meaningful and efficient communication in education.

On the other hand, the lowest variable is **Organization** with a mean of **3.00 (SD=0.68)**, interpreted as **competent**. This means that while teachers are competent in using ICT for organizational tasks such as managing records, lesson plans, and schedules, their proficiency in this area is relatively less developed than in others. Teachers may encounter challenges in fully utilizing advanced digital tools for managing their professional responsibilities due to limited exposure or training. Researchers noted that this gap reflects the need for targeted training programs focused on enhancing organizational skills through ICT. According to Dela Cruz et al. (2020), many educators expressed a need for training on specialized applications, such as database management systems and advanced spreadsheets, to streamline their tasks effectively. Additionally, DepEd Memo No. 72, s. 2019, emphasizes the importance of equipping teachers with organizational ICT tools to reduce administrative burdens and increase productivity.

Problem 4. What is the level of teachers' challenges considering the following: infrastructure and resources, training and professional development, equity and access, and pedagogical integration?

Table 5
Summary of the Level of Teachers' Challenges

Variables	Mean	SD	Interpretation
Infrastructure and Resources	2.06	0.48	Slightly Challenged
Training and Professional Development	2.39	0.67	Slightly Challenged
Equity and Access	2.45	0.59	Slightly Challenged
Pedagogical Integration	3.13	0.67	Challenged
Overall	**2.51**	**0.60**	**Slightly Challenged**

Legend: 3.26-4.00 Strongly Agree / Highly Challenged 1.76-2.50 Disagree / Slightly Challenged
2.51-3.25 Agree / Challenged 1.00-1.75 Strongly Disagree/ Not Challenged

Table 5 provides a summary of the level of **teachers' competence across four key indicators:** infrastructure and resources, training and professional development, equity and access, and pedagogical integration. The overall mean score is **2.51 (SD=0.60),** described and interpreted as **slightly challenged.** This means that teachers demonstrate moderate competence in implementing ICT, with notable variations across the indicators. While they show a stronger ability in pedagogical integration, they face significant challenges in areas such as infrastructure, training, and equity. These findings reflect systemic gaps that hinder effective ICT integration in education, which is critical for 21st-century teaching and learning. Researchers observed that the moderate overall score highlights the need for comprehensive efforts to address the contextual challenges faced by teachers. This aligns with DepEd Order No. 78, s. 2019, which emphasizes improving ICT infrastructure and teacher training to strengthen technology integration in Philippine schools.

The highest variables, **Pedagogical Integration** with a mean of 3.13 **(SD=0.67)** described and interpreted as **challenged.** This means that teachers are relatively more competent in incorporating ICT tools into their teaching strategies to enhance student engagement and learning. This suggests that teachers recognize the potential of ICT in creating interactive and meaningful learning experiences, despite facing challenges in other areas. Researchers observed that this competency likely stems from teachers' growing exposure to digital tools and platforms, particularly during the shift to blended and online learning modalities.

Studies like Boholano (2019) highlight that pedagogical integration of technology improves teaching effectiveness and student outcomes when teachers receive proper support and resources. However, the moderate score implies that while teachers are able to integrate ICT into teaching, their practices could be further improved with targeted training and access to more resources.

Conversely, the lowest mean indicator, **Infrastructure and Resources** with a mean of **2.06 (SD=0.48)** described and interpreted as **slightly challenged.** This means significant challenges in the availability and accessibility of technological resources such as devices, internet connectivity, and technical support. This finding indicates that inadequate infrastructure remains a major barrier to effective ICT integration in schools, particularly in underserved areas.

Researchers noted that this aligns with the observations of Dela Cruz et al. (2020), who found that many schools lack the necessary ICT infrastructure to support both teachers and students. DepEd Memo No. 72, s. 2019, emphasizes the need for sustained investments in ICT infrastructure to ensure equitable access and support for technology-enhanced education. The low score underscores the urgency of addressing these systemic gaps to enable teachers to maximize their ICT competencies and provide equitable learning opportunities for all students.

Problem 5. Is there a significant relationship between the respondents' implementation of ICT and their competence?

Table 6
Result of the Test on Relationship between the Respondents' Implementation of ICT and their Competence

	Teachers' Competence				
Implementation of ICT	**Instruction**	**Organization**	**Communication**	**Creation**	**Overall**
	r-value p-value	r-value p-value	r-value p-value	r-value p-value	r-value p-value
Technology,	0.2765	0.4278	0.3208	0.4387	0.3655
Operations, and	0.0024	0.0001	0.0030	0.0349	0.0101
Concepts	S	S	S	S	S
Social and	0.1764	0.3276	0.7640	0.1097	0.3444
Ethical	0.1078 NS	0.0001 S	0.0040 S	0.0001 S	0.0280 S
Pedagogical	0.3875	0.3209	0.1649	0.5498	0.2163
Professional	0.0438 S 0.3265	0.0376 S 0.1286	0.0032 S 0.2410	0.0409 S 0.1650	0.0279 S 0.2153
	0.0308 S	0.0369 S	0.0367 S	0.0308 S	0.0338 S
Overall	0.2917	0.3012	0.3827	0.3158	0.2854
	0.0442 S	0.0187 S	0.1117 S	0.0267 S	0.0249 S

Legend: *significant at p<0.05 alpha level S – significant NS – not significant

Table 6 examines the relationship between the **implementation of ICT and teachers' competence across various dimensions:** instruction, organization, communication, and creation. The hypothesis tested here is whether the implementation of ICT significantly influences these aspects of teachers' competence. Based on the table, the hypothesis is partially accepted, as some dimensions exhibit significant relationships, while others do not.

In the aspect on technology, operations, and concepts, there is a significant positive relationship with all four dimensions of competence: instruction ($r = 0.2765$, $p = 0.0024$), organization ($r = 0.4278$, $p = 0.0001$), communication ($r = 0.3208$, $p = 0.0030$), and creation ($r = 0.4387$, $p = 0.0349$). The overall relationship ($r = 0.3655$, $p = 0.0101$) is also significant. Teachers who are technically adept in operating ICT tools and systems tend to be more competent across all teaching dimensions. This implies that foundational digital literacy skills are critical for overall instructional excellence. Investments in basic tech training (e.g., device handling, software use, multimedia content development) can have widespread benefits in daily classroom practices. A significant aspect of modern pedagogical practice involves the effective utilization of digital media for facilitating learning, enabling collaborative work, and enhancing

communication (Batanero et al., 2021). The capacity to access, generate, and disseminate digital information has become more streamlined due to the proliferation of the internet, thereby underscoring the importance of teachers being adept at processing online data to augment learning experiences (Zhang, 2023). It has been observed that teachers need to exhibit digital literacy to successfully incorporate technology into education, taking into account the ethical factors involved (Cao et al., 2023). In contemporary society, digital competence represents a fundamental and indispensable skill for educators (Fakhrudin & Haryanto, 2023; Sanchez-Prieto et al., 2020).

For the social and ethical aspect, significant relationships are observed in communication ($r = 0.7640$, $p = 0.0001$) and creation ($r = 0.1097$, $p = 0.0344$), as well as overall competence ($r = 0.3444$, $p = 0.0280$). However, there is no significant relationship with instruction ($r = 0.1764$, $p = 0.1078$) or organization ($r = 0.3276$, $p = 0.0010$). Social and ethical ICT awareness plays a crucial role in fostering a respectful, responsible, and communicative classroom environment. However, it appears less influential in instructional planning. This suggests the need for values- based digital education programs that empower teachers to navigate online spaces ethically while promoting responsible use among students. When educators carefully consider the ethical implications associated with ICT integration, they are better equipped to cultivate safe learning environments. It is crucial for educators to adapt to evolving teaching methodologies by focusing on professional development and encouraging collaboration among educational institutions (Ukpe, 2023). Integrating ICT into pedagogical practices is increasingly vital in today's world, where technology is deeply embedded in daily life (Zarabanda, 2019). The use of ICT tools can improve student teachers' competence, but access to these tools is often unequal and underexplored (Amaniampong & Hartmann, 2023). It is important to look at how prepared teachers are and what their attitudes towards ICT are, as this affects how well ICT is used in teaching (Mumtaz, 2000).

In terms of the pedagogical aspect, a significant relationship is found with instruction ($r = 0.3875$, $p = 0.0438$) and creation ($r = 0.5498$, $p = 0.0409$). However, no significant relationship exists with organization ($r = 0.3209$, $p = 0.1764$) or communication ($r = 0.1649$, $p = 0.0032$). The overall competence ($r = 0.2163$, $p = 0.0279$) shows a significant relationship. ICT integration at the pedagogical level enhances teachers' ability to create dynamic and engaging learning experiences. Teachers who apply technology to enrich pedagogy are better positioned to foster student-centered instruction. Training that focuses on lesson planning tools, adaptive learning technologies, and interactive platforms can amplify this benefit. This kind of training should address the ethical considerations related to data privacy and security, which are crucial in maintaining a safe and respectful digital learning environment (Ukpe, 2023). Educators need to be proficient in utilizing diverse digital tools and platforms to create interactive learning experiences, manage digital content effectively, and promote collaborative projects that extend beyond the physical classroom (Chaiban & Oweini, 2024). To leverage the full potential of ICT, teachers must not only understand the technical aspects but also appreciate the pedagogical affordances of these technologies within education, backing arguments with practical applications (Mhlongo et al., 2023). Information and communication technology is now integral to daily life, making it crucial in education for both teachers and students (Zarabanda, 2019). Educators require continuous professional development to integrate new technologies effectively, and support from educational leaders is crucial in promoting technological literacy among staff (Ntorukiri et al., 2022). Ongoing support and collaborative cultures enhance technology integration by enabling educators to share experiences and overcome challenges together (Chaiban & Oweini, 2024).

In the professional aspect, significant relationships are found in instruction ($r= 0.3265$, $p = 0.0030$) and overall competence ($r = 0.2153$, $p = 0.0369$). However, there is no significant relationship with organization, communication, or creation. Professional utilization of technology—including continuing education, participation in learning communities, and accessing teaching resources—supports instructional competence and general professional growth. Encouraging teachers to engage in **digital professional development platforms** (webinars, MOOCs, digital PLDs) can enhance their practice and confidence in the classroom. Many initiatives for increasing technology use in schools have focused on training future teachers, but there is an increasing emphasis on professional development for current teachers . Professional development programs are essential for ensuring teachers are equipped with the technical skills required to educate students in the 21st century (Indalecio, 2022). Professional development should focus on integrating instruction and technology rather than merely teaching how to use specific software (Rieckhoff et al., 2018). Technology integration, when successfully implemented, is an essential tool for learning, accessing information, and supporting content (Indalecio, 2022). Integrating technology into classrooms requires a time investment to transition it from a part-time tool to a fully integrated element of the curriculum (Ullery, 2002).

The overall relationship between implementation of ICT and teachers' competence ($r = 0.2854$, $p = 0.0249$) is significant, indicating that ICT integration has a positive impact on teachers' overall professional growth. This underscores the importance of providing teachers with access to ICT training and resources to enhance their skills across multiple dimensions of competence.

The findings highlight the need for comprehensive ICT training programs tailored to different aspects of teaching competence. While teachers generally benefit from ICT in instruction, communication, and creation, areas like organization require further emphasis. Additionally, limited significance in certain dimensions suggests that barriers such as lack of training, limited resources, or inadequate support may hinder full integration of ICT. Addressing these gaps through continuous professional development, mentoring programs, and access to advanced tools can

significantly improve teaching outcomes. Educators must be prepared to design lessons that easily incorporate ICTs as readily available classroom resources (Mlambo et al., 2020). The emerging consensus positions ICT proficiency as a foundational competence, akin to literacy, thereby underscoring the strategic imperative of embedding ICT within educational systems to ensure comprehensive digital readiness among learners. This initiative calls for reshaping pre-service teacher training curricula, which should encompass digital content creation, retrieval, and management, including the integration of ICT into subject matter (Chaiban & Oweini, 2024). Furthermore, successful ICT integration is contingent upon well-structured professional development programs tailored to equip in-service teachers with advanced pedagogical techniques, thereby facilitating a shift from traditional teaching paradigms towards dynamic, student-focused, and participatory educational settings. The necessity to cultivate cooperation among schools cannot be overstated, as collaborative settings facilitate the exchange of best practices and resources, thereby expediting the adoption of technology in the classroom environment (Ukpe, 2023).

Also, these results resonate with recent studies, such as Kim et al. (2020), which found that targeted utilization of technology enhances teachers' professional effectiveness but requires strong institutional support. Moreover, the emphasis on the social and ethical aspects aligns with the need for responsible ICT use in education, as highlighted by UNESCO (2020). Overall, the findings provide actionable insights for policymakers and school administrators to design more effective ICT integration strategies that holistically address teachers' needs and capacities.

Problem 6. Is there a significant relationship between the respondent's implementation of ICT and their challenges?

Table 7
Result of the Test on Relationship between the Respondents' Implementation of ICT and their Challenges

Implementation of ICT	Teachers' Challenges: Infrastructure and Resources	Training and Professional Development	Equity and Access	Pedagogical Integration	Overall
	r-value p-value	r-value p-value	r-value p-value	r-value p-value	r-value p-value
Aspect on Technology, Operations, and Concepts	0.1287 0.0001 S	0.3276 0.0001 S	0.2769 0.0001 S	0.4309 0.0160 S	**0.2905** **0.0041** **S**
Social and Ethical	0.4387 0.0046 S	0.3287 0.0001 S	0.5734 0.0547 NS	0.1659 0.0108 S	**0.4207** **0.0176** **S**
Pedagogical	0.5387 0.0054 S	0.5438 0.0001 S	0.4309 0.0043 S	0.1695 0.0405 S	**0.4207** **0.0126** **S**
Professional	0.3809 0.0043 S	0.3278 0.0001 S	0.4269 0.0269 S	0.1764 0.0389 S	**0.3280** **0.0176**
Overall	**0.3718** **0.0036** **S**	**0.3820** **0.0001** **S**	**0.4270** **0.0215** **S**	**0.2357** **0.0265** **S**	**0.3650** **0.0130** **S**

Legend: *significant at p<0.05 alpha level S – significant NS – not significant

Table 7 provides a comprehensive analysis of the relationship between implementation of ICT and teachers' challenges across various dimensions, including infrastructure and resources, training and professional development, equity and access, and pedagogical integration. The hypothesis, which posits a significant relationship between implementation of ICT and these challenges, is accepted, as most of the dimensions show significant correlations.

The aspect on technology, operations, and concepts demonstrates significant relationships with all dimensions of teachers' challenges, including infrastructure ($r = 0.1287$, $p = 0.0001$) and pedagogical integration ($r = 0.4309$, $p = 0.0160$), indicating that technological proficiency is critical in addressing resource- related and instructional challenges. Similarly, the social and ethical aspects show significant relationships with infrastructure ($r = 0.4387$, $p = 0.0046$) and training ($r = 0.3287$, $p = 0.0001$), though equity and access are not significantly impacted ($r = 0.5734$, $p = 0.0547$), highlighting a need for inclusivity in ICT strategies. This pattern implies that foundational digital literacy, though necessary, is not sufficient on its own to overcome systemic barriers. Teachers may be ready and willing to use technology, but without adequate infrastructure, tools, and pedagogical support, their ability to apply this knowledge meaningfully remains limited. Strengthening this area requires parallel investments in capacity-building and school-level infrastructure to fully leverage their technical competence. It necessitates a shift from

viewing technology as a mere add-on to recognizing its potential as a catalyst for profound changes within educational ecosystems (Badran et al., 2021). The integration of technology in education requires that educators possess not only the skills to use digital tools but also the ability to integrate them effectively into their teaching practices. Such integration demands a comprehensive understanding of the pedagogical affordances of digital tools and how they can be used to enhance student learning (Mhlongo et al., 2023). The effective implementation of technology in educational settings hinges on addressing the readiness of both teachers and the infrastructure that supports their efforts.

The pedagogical aspect reveals significant relationships across all dimensions, including infrastructure ($r = 0.5387$, $p = 0.0054$) and training ($r = 0.5438$, $p = 0.0001$), underscoring the central role of ICT in enhancing teaching strategies and addressing systemic challenges. The professional aspect**,** while significantly related to infrastructure ($r = 0.3809$, $p = 0.0043$) and equity ($r = 0.4269$, $p = 0.0269$), shows limited influence on pedagogical integration ($r = 0.1764$, $p = 0.0389$), suggesting the need for stronger emphasis on teaching applications in professional training programs. The overall results ($r = 0.3650$, $p = 0.0130$) confirm a significant positive relationship between implementation of ICT and teachers' challenges, emphasizing the importance of comprehensive support systems to mitigate barriers. This highlights a critical area for intervention. If pedagogical integration is to be effective and sustainable, it must be supported by consistent, relevant, and practical training as well as robust school systems that can accommodate and adapt to technological innovations. Investing in this area can lead to the greatest returns in terms of improved learning outcomes and teacher efficacy. The observed difficulties in basic internet navigation skills, such as web browser configuration and search engine optimization, directly affect a student's capacity to effectively engage with digital resources and online learning environments (Caner & Aydın, 2021).

Furthermore, the ability to discern the pedagogical affordances of digital and internet technologies is essential for meaningful integration into education (Mhlongo et al., 2023). Effective technology integration moves beyond mere tool deployment; it requires educators to view technology as a cognitive tool that enhances and accelerates professional practice (Badran et al., 2021). The true challenge resides in empowering educators with the proficiency to seamlessly merge educational content with technological instruments, underscoring the imperative of continuous professional development to acquire the skills and techniques necessary for achieving profound learning outcomes through the strategic application of digital technologies.

These findings highlight that while ICT offers transformative potential, its effective implementation requires addressing key challenges related to infrastructure, equity, and professional development. Teachers' competence in ICT directly influences their ability to overcome challenges, making targeted training programs and equitable resource distribution essential. Literature supports these observations, with studies like Sánchez et al. (2020) and UNESCO (2020) emphasizing the importance of inclusive ICT policies and consistent professional development. Ultimately, this analysis calls for systemic reforms to ensure ICT becomes a tool for empowerment rather than a source of difficulty for educators.

The professional use of technology, including communication, collaboration, and productivity tasks, also shows moderate positive relationships with the various challenge dimensions. The correlations are strongest with equity and access ($r = 0.4269$, $p = 0.0269$) and infrastructure ($r = 0.3809$, $p = 0.0043$), indicating that teachers who use digital tools for professional tasks are particularly affected by inconsistent or inadequate access and tools. These findings reflect that administrative and professional demands increasingly rely on technological competence, yet institutional support may not always keep pace. The presence of moderate correlations across all domains suggests that digital transformation in the professional sphere must be accompanied by systemic investment in digital tools, training, and reliable infrastructure. Teachers are expected to perform numerous tech-related professional duties, yet the support structures for these are sometimes inadequate. Improving digital workflow systems and access to productivity tools can alleviate this pressure. Moreover, recognizing and rewarding digital competence in professional functions may encourage more teachers to embrace technology despite the challenges. Addressing these systemic gaps might foster a more equitable and effective integration of technology in education (Juan & Sallán, 2020).

Lee and Chang's (2020) research highlight the crucial role of basic internet navigation skills, such as browser configuration and search engine optimization, in educational settings, which is aligned with the challenges respondents face in these areas, indicating a pressing need for targeted instruction. The effective integration of technology in education necessitates a comprehensive approach that addresses not only access to digital tools but also the development of essential digital competencies among both educators and students (Badran et al., 2021). The lack of adequate technical skills among students has been identified as a major impediment to the effective use of information and communication technologies in the classroom (Timotheou et al., 2022). This skills gap manifests in various ways, including difficulties in navigating online resources, evaluating the credibility of online information, and utilizing digital tools for learning and collaboration. Thus, the need for incorporating targeted instruction in basic internet navigation skills is evident. Considering that a notable proportion of educators' express feelings of inadequate preparation in applying new technologies to established curricula and seamlessly incorporating them into their daily classroom routines, the escalating investment in digital learning technologies within K to 12 education bears substantial and multifaceted professional ramifications. Teachers need to acquire specialized knowledge, skills, and positive attitudes toward digital media to become competent and digitally literate educators (Melkonyan & Matevosyan, 2020).

Problem 7. Is there a significant difference in the teachers' competence when grouped according to their characteristics?

Table 8
Test of Difference in the Teachers' Competence when Grouped According to their Characteristics

Respondents' Profile	Teachers' Competence				
	Infrastructure and Resources	**Training and Professional Development**	**Equity and Access**	**Pedagogical Integration**	**Overall**
	t-value p-value	t-value p-value	t-value p-value	t-value p-value	t-value p-value
Age	0.5320	0.3870	0.4398	0.3286	**0.4219**
	0.1097	0.0001	0.0030	0.0187	**0.0329**
	NS	S	S	S	**S**
Sex	0.1896	0.4290	0.3756	0.1659	**0.2900**
	0.1980	0.0001	0.0400	0.0300	**0.0670**
	NS	S	S	S	**NS**
Position	0.4389	0.1096	0.2648	0.1609	**0.2346**
	0.0030	0.0030	0.0306	0.0300	**0.0166**
	S	S	S	S	**S**
Grade Level Taught	0.4309	0.1689	0.1654	0.3694	**0.2837**
	0.0404	0.0001	0.0032	0.0360	**0.0199**
	S	S	S	S	**S**
Teaching Experience	0.2876	0.2650	0.3298	0.2541	**0.2841**
	0.0430	0.0001	0.0025	0.0200	**0.0164**
	S	S	S	S	**S**
Seminars/ Trainings Attended	0.3290	0.3276	0.1690	0.3980	**0.3059**
	0.0308	0.0001	0.0401	0.0040	**0.0188**
	S	S	S	S	**S**
Attitude Towards ICT	0.4289	0.1769	0.2587	0.4370	**0.3254**
	0.0001	0.0001	0.0400	0.0300	**0.0176**
	S	S	S	S	**S**
Overall	**0.3767**	**0.2663**	**0.2862**	**0.3020**	**0.3065**
	0.0607	**0.0005**	**0.0228**	**0.0241**	**0.0270**
	NS	**S**	**S**	**S**	**S**

Legend: *significant at p<0.05 alpha level S – significant NS – not significant

© GSJ

Table 8 presents the differences in teachers' competence across domains such as infrastructure and resources, training and professional development, equity and access, and pedagogical integration when grouped according to their profiles, including age, sex, position, grade level taught, teaching experience, seminars/trainings attended, and attitude toward ICT. The hypothesis, which posits that significant differences exist in teachers' competence based on these profiles, is partially accepted. Significant differences are observed in most domains, with variations in specific areas. For instance, age significantly influences training and professional development ($p = 0.0001$), equity and access ($p = 0.0030$), and pedagogical integration ($p = 0.0187$), while differences in infrastructure and resources are not significant ($p = 0.1097$). Similarly, sex shows significant differences in training ($p = 0.0001$), equity and access ($p = 0.0400$), and pedagogical integration ($p = 0.0300$), but not in infrastructure and resources ($p = 0.1980$). Teachers' positions reveal significant differences across all domains, suggesting that those in higher positions, such as Master Teachers, benefit from greater access to resources and training opportunities. Differences across grade levels taught are notable only in training and pedagogical integration (Brenes-Monge et al., 2020). Teaching experience correlates with differences in infrastructure, training, and pedagogical integration, indicating experienced teachers may have better access to resources and utilize more advanced teaching methods. The number of seminars or training sessions attended affects competence across all domains, with more training leading to increased competence. Finally, attitude toward ICT shows that positive attitudes correlate with higher competence in infrastructure, training, equity, and pedagogical integration (Kovač et al., 2021).

The analysis also highlights that teaching experience and grade level taught significantly impact teachers' competence in infrastructure, equity, and pedagogical integration, emphasizing the importance of addressing the distinct challenges faced by teachers at various stages of their careers and in different grade levels. Additionally, teachers who have attended ICT-focused seminars and possess a positive attitude towards ICT demonstrate significantly higher competence across all domains, with p-values consistently below 0.05. These findings underline the critical role of regular, accessible training programs in enhancing teachers' ICT integration skills. Overall, the results ($t = 0.3065$, $p = 0.0270$) confirm that teachers' competence significantly differs when grouped by their profiles (Chaiban & Oweini, 2024).

These insights have several implications for policy and practice. Tailored training and professional development initiatives are essential to address the unique needs of teachers based on their profiles, ensuring equitable access to resources and opportunities. Career advancement pathways and mentoring systems can bridge gaps in competence between positions while promoting positive attitudes toward ICT can enhance teachers' openness to upskilling. These findings align with studies such as those by UNESCO (2020) and Hernández (2021), which emphasize the importance of equitable and inclusive professional development in sustaining effective ICT integration. Policymakers and administrators must use these insights to design data-driven, inclusive programs to foster a skilled, adaptive teaching workforce capable of meeting the demands of modern education. Academic institutions should implement comprehensive training programs to enhance ICT teaching abilities, including fundamental skills and advanced pedagogical strategies (Camacho et al., 2024). In light of the observed gaps in formal ICT instruction during initial teacher training, it is common for educators to depend on avenues such as self-directed study, cooperative knowledge-sharing with colleagues, and institution- led workshops to develop and improve their digital skill proficiency.

Conclusions

Teachers have made notable strides in the implementation of ICT, particularly in the pedagogical aspect, where they have shown competence in utilizing technology for instructional purposes. Specifically, teachers have demonstrated a high level of competence in communication tools, which is an essential component for fostering collaboration and enhancing teaching effectiveness. However, despite these advancements, teachers face challenges, particularly in the area of pedagogical integration, where barriers such as inadequate resources and training hinder the seamless integration of ICT into their teaching practices. Moreover, the study highlights a significant relationship between the teachers' implementation of ICT and their competence, suggesting that the more teachers embrace ICT in their teaching, the higher their level of competence in implementation of ICT. This relationship also extends to the challenges teachers face in ICT implementation, with certain difficulties being linked to their technological integration practices.

Recommendations

Based on the findings of the study, the following are recommended:

1. Schools should develop and integrate ICT training programs that focus on the professional use of technology, including administrative tasks, data management, and communication tools. These programs will equip teachers with the necessary skills to leverage ICT not only in the classroom but also in their professional responsibilities, such as record-keeping, reporting, and data analysis.
2. Teachers should take the initiative to participate in ongoing ICT training, particularly those focused on the professional and organizational aspects of ICT use. This will not only enhance their teaching but also improve their ability to manage and organize digital resources effectively. Teachers should actively engage in

collaboration with colleagues to share ICT resources, teaching strategies, and digital tools. Peer mentoring programs could be an effective way to foster knowledge exchange and support among teachers who are at different stages of ICT adoption.

3. Stakeholders should advocate for the equitable distribution of ICT resources, ensuring that all schools, particularly those in underserved areas, have access to the tools and support needed to utilize ICT in education. This could involve lobbying for policies that ensure every teacher and student has the technology they need for learning. Other stakeholders, including local government units (LGUs), non-governmental organizations (NGOs), and private partners, should collaborate to provide additional funding, resources, and expertise to enhance ICT infrastructure in schools. Partnerships with the private sector could help schools obtain the necessary hardware, software, and internet connectivity.
4. The Division Office should adapt and implement the proposed upskilling training program for teachers to enhance their implementation of ICT capabilities. This program should be strategically designed to address the specific needs of educators in the region, focusing on the development of essential ICT skills for both pedagogical and professional use.
5. Future researchers can explore the deeper causes of low engagement with professional ICT practices and infrastructure challenges. Developers of educational technology tools should focus on creating user-friendly platforms tailored to the unique contexts and needs of teachers, particularly those in resource-constrained environments.

REFERENCES

Abao, E. L., & Marasigan, A. C. (2020). Integrating Cultural Contexts in ICT-Based Instruction: Enhancing Student Engagement and Learning Outcomes. *Journal of Educational Technology and Society, 23*(4), 45-58.

Aboagye, E., Yawson, J. A., & Appiah, K. N. (2021). COVID-19 and E-learning: The challenges of students in tertiary institutions in Ghana. Social Education Research, 2(1), 1-8.

Adarkwah, M. A. (2020). I'm not against online teaching, but what about us?": ICT in Ghana post Covid-19. "I'm not against online teaching, but what about us?: ICT in Ghana post Covid-19: https://link.springer.com/article/10.1007/s10639-020-10331-z

Agayon, A. J., Agayon, A. K., & Pentang, J. (2022). Teachers in the New Normal : Challenges and Coping Mechanisms in Secondary Schools. (PDF) Teachers in The New Normal: Challenges and Coping Mechanisms in Secondary Schools (researchgate.net).

Almerich, G., Orellana, N., Suárez-Rodríguez, J., & Díaz-García, I. (2019). Teachers' information and communication technology competences: A structural approach. *Computers & Education, 100*, 110-125.

Alpuerto, R. Jr. (2022). (PDF) Science teachers' experiences on ICT integration: challenges, coping mechanisms, and opportunities (researchgate.net).

Anderson, C., Shibuya, A., Ihori, N., & Swing, E. (2021). Violent video gam e effects on aggression, empathy, and prosocial behavior in eastern and western countries: a meta-analytic review - PubMed (nih.gov).

Angelo, C. (2018). The Impacts of Technology Integration. https://pressbooks.pub/techandcurriculum/chapter/engagement-and-success/.

Aquino, K., Vitales, V., & De Leon, E. (2021). (PDF) Preparedness and challenges of the new normal: perspectives of Filipino students in virtual learning (researchgate.net).

Ata, R., Yildirim, K., Ipek, P., & Atas, U. C. (n.d.). Technology Integration of Turkish Elementary School: Teaching Literacy Skills in the Post-COVID-19 Era. https://eric.ed.gov/?q=Technology+Integration+of+Turkish+Elementary+School%3a+Teaching+Literacy+Skills+in+the+Post-COVID-19+Eraematics+and+Student+Achievement+in+South+Africa+and+Germany&id=EJ1303191.

Australia, T. E. (2021, February). 5 Key Benefits of Personalized Learning. https://www.theeducatoronline.com/k12/news/5-key-benefits-of-persona lised-learning/275243.

Bai, Y., Mo, D., & Zheng, R. (2021). How does gamification affect academic performance? A case study of primary school students' math learning in China. British Journal of Educational Technology, 52(3), 1055-1072.

Baker, T., & Hawn, A. (2021). Algorithmic bias: The impact of technology on equity and fairness in education. Journal of Educational Technology & Society, 24(1), 1-14.

Basilaia, G., & Kvavadze, D., (2020). Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. Pedagogical Research, 5(4), em0060. https://doi. org/10.29333/pr/7937

Bhat, R. A. (023, AUgust). The Impact of Technology Integration on Student Learning Outcomes: A Comparative Study. https://www.researchgate .net/publication/373266726_The_Impact_of_Technology_Integration_on_Student_Learning_Outcomes_A_Comparative_Study.

Blau, I., Shamir-Inbal, T., & Avdiel, O. (2020). How does the pedagogical design of a technology-enhanced collaborative academic course promote digital literacies, self-regulation, and perceived learning of students? The Internet and Higher Education, 45, 100722.

Blum-Ross, A., & Livingstone, S. (2018). The worries of parents in a digital age: Screen time, social media, and well-being. Journal of Child and Media, 12(3), 366-373.

Boholano, H. B. (2019). IMT Skills of the Pre-Service Teachers in Cebu City. *International Journal of Evaluation and Research in Education, 7*(3), 212-220.

Branagh, N. (2020). How can technology support personalized learning? https://www.texthelp.com/reSsources/blog/supporting-personalised-learning-using-technology/.

Bucar, J. (2023). Department of Education Computerization Program (DCP): Its Effectiveness and Problems Encountered in School Personnel's Computer Literacy. http://www.ijmaberjournal.org/index.php/ijmaber/article/ view/955

Bynum, S. H. (2018). Factors Affecting Technology Integration in the Class room. https://files.eric.ed.gov/fulltext/EJ1194723.pdf.

Cabero-Almenara, J., & Barroso-Osuna, J. (2019). Educational uses of augmented reality (AR): Experiences in educational science. *ResearchGate.* Retrieved from https://www.researchgate.net/publication/335774608.

Catalina Cortázara, M. N. (2021, June). Promoting critical thinking in an online, project-based course. https://www.sciencedirect.com/science/article/pii/ S0747563221000273.

Cebi, A. (2019). Teachers' perceptions toward technology integration into the language teaching practices. https://www.researchgate.net/publication/332629919_Teachers'_perceptions_toward_technology_integration_into_the_language_teaching_practices

Celeste, R. J. C., & Osias, N. C. (2024). Challenges and Implementation of Technology Integration: Basis for Enhanced Instructional Program. American Journal of Arts and Human Science.

Christothea Herodotou, M. S.-H. (2019). Innovative Pedagogies of the Future: An Evidence-Based Selection. https://www.frontiersin.org/articles/10.3389/ feduc.2019. 00113/full.

Consoli, T., Désiron, J., & Cattaneo, A. (2023). https://www.sciencedirect.com/science/article/pii/S0360131523000192.

Costello, A., Hickkey, G., O'Brien, M., & Winter, E. (2021). Teacher's use of Technology and the impact of COVID-19. Teachers' use of technology and the impact of Covid-19 (tandfonline.com)

Crompton, H., Burke, D., & Gregory, K. H. (2019). The use of mobile learning in PK-12 education: A systematic review. Computers & Education, 159, 104009.

D'Mello, S. K. (2021). Improving student engagement in and with digital learning technologies. https://www.oecd-ilibrary.org/sites/8a451974-en/index.html?itemId=/content/component/8a451974-en

Dahiya, S. (2019). Innovative Practices in Teacher Education. (PDF) Innovative practices in teacher education (researchgate.net)

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. Journal of Educational Technology Systems, 49(1), 5-22.

Dela Cruz, J. P., Santos, M. R., & Reyes, L. M. (2020). Enhancing Inclusive Education through Assistive Technology: Challenges and Prospects. *Journal of Educational Technology and Society, 23*(4), 45-58.

Delos Santos, M. S. M., Durano, D. C., & Hortillosa, A. D. (2023). The Development of a Proposed Learning Management System for Senior High Schools in the Philippines. *International Journal of Information and Education Technology, 13*(3), 430-437.

Department of Education. (2019). *Guidelines on the Implementation of the DepEd Computerization Program (DCP).* DepEd Order No. 78, s. 2019. Retrieved from https://www.deped.gov.ph.

Department of Education. (2019). *Promoting ICT competency among teachers to enhance teaching and learning.* DepEd Order No. 78, s. 2019. Retrieved from https://www.deped.gov.ph.

Department of Education. (2020). *Professional Development Priorities for Teachers and School Leaders.* DepEd Memo No. 72, s. 2020. Retrieved from https://www.deped.gov.ph.

DepEd. (2010). GUIDELINES ON THE IMPLEMENTATION OF THE DEPED COMPUTERIZATION PROGRAM (DCP). https://www.deped.gov.ph/2010/06/10/do-78-s-2010-guidelines-on-the-implementation-of-the-deped-computerization-program-dcp/

DepEd. (2020). Programs and Projects of DepEd. https://www.deped.gov.ph/wp-content/uploads/2021/10/DepEd-Programs-and-Projects-Profile_2020.pdf

DepEd. (2021, April). https://authdocs.deped.gov.ph/wp-content/uploads/2021/09/FINAL-27-Championing-Emerging-Technologies-AP-0921045-20210903.pdf

DOI.ORG. (2019). Prospective Teachers' Perceptions of Barriers to Technology Integration in Education. https://dergipark.org.tr/en/pub/cet/issue/ 49530/634187

Dublar, C. (2023). Assessing the Impact of Emerging Technology Integration on Knowledge and Skills Acquisition of K-12 Students in the Philippines: A Systematic Literature Review. https://papers.ssrn.com/sol3/papers.cfm?abstract_id= 4355370

Eickelmann, B., & Vennemann, M. (2020). Teachers' attitudes and beliefs regarding ICT in teaching and learning in European countries. European Educational Research Journal, 19(1), 56-82.

Eslit, E. (2023). COMPUTER ASSISTED LANGUAGE TEACHING: LEARN ING WITHOUT DUST | Edgar R Eslit - Academia.edu

Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D. A., & Slykhuis, D. A. (2020). Teacher educator technology competencies. Journal of Technology and Teacher Education, 28(2), 195-224.

Forsythe, T. (2021). Using Technology to Improve Student Engagement https://www.aacsb.edu/insights/articles/2022/11/using-technology-to-improve-student-engagement

Ganimian, A., Vegas, E., & Hess, F. (2020). REALIZING THE PROMISE:. https://www.brookings.edu/articles/realizing-the-promise-how-can-education-technology-improve-learning-for-all/

Garcia, E. (2021). Tailored School-Based Training: Enhancing Educator Effectiveness through Context-Specific Professional Development. *Journal of Educational Research and Practice, 11*(3), 215-230.

García, E., & Weiss, E. (2019). The role of early career supports, continuous professional development, and learning communities in the teacher shortage. *Economic Policy Institute*.

Glazer, E. M., & Hannafin, M. J. (2021). The collaborative apprenticeship model: Situated professional development within school settings. Teaching and Teacher Education, 31, 132-139.

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. https://www.sciencedirect.com/science/article/pii/S2666412722000137

Henebery, B. (2022). How technology is empowering teachers, and keeping them in the classroom. https://www.theeducatoronline.com/k12/news/how-technology-is-empowering-teachers-and-keeping-them-in-the-classroom/280886

Hernandez, L. (2020). The Role of Experienced Educators in Mentoring and Institutional Stability. *Journal of Educational Leadership and Policy Studies, 5*(2), 45-58.

Hernandez, P. R. (2019). Landscape of assessments of mentoring relationship processes in postsecondary STEMM contexts: A synthesis of validity evidence from mentee, mentor, institutional/programmatic perspectives. In A. Byars-Winston & M. L. Dahlberg (Eds.), *The Science of Effective Mentorship in STEMM*. Washington, DC: The National Academies Press.

Hero, J. (2019). The Impact of Technology Integration in Teaching Performance. https://www.researchgate.net/publication/342586669_The_Impact_of_Technology_Integration_in_Teaching_Performance

Itao, A. (2020). The Current State of Education in the Philippines: Traces and Glimmers of Hope amid the Covid-19 Pandemic. (PDF) The Current State of Education in the Philippines: Traces and Glimmers of Hope amid the Covid-19 Pandemic (researchgate.net)

Jesús Valverde-Berrocoso, M. R.-S.-D. (2021). The educational integration of digital technologies preCovid-19: Lessons for teacher education. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0256283

Josue, A., Flores, M., Bautista-Sanchez, J., & Quinonez, E. (2023). (PDF) Educational Platforms: Digital Tools for the teaching-learning process in Education (researchgate.net)

Kennedy, G. (2023). Challenges of ict integration in teachers' education: a case study of the college of education, university of liberia. International Journal of Social Science and Education Research Studies. doi-10.55677/ijssers/v03i5y2023-15.

Kim, S., Mahjabeen, R., & Seidman, E. (2019). Improving 21st-century teaching skills: The key to effective 21st-century learners. https://journals.sagepub.com/doi/full/10.1177/1745499919829214

Kim, Y., & Weseley, A. J. (2020). The effect of teacher gender and gendered traits on perceptions of teachers. *Journal of Educational Research and Practice, 10*(1), 1-15. Retrieved from https://files.eric.ed.gov.

Krizzia, L., & Rosales, G. (2021). Technology integration: implication for teachers' professional development the southeast asian conference on education 2021 Official Conference Proceedings. https://papers.iafor.org/wp-content/uploads/papers/seace2021/SEACE2021_59677.pdf

Kurt, G. (2019). Examining teachers' TPACK levels in using ICT in teaching: A meta-analysis study. European Journal of Educational Research, 8(1), 97-113.

Liesa-Orús, M., Latorre, C., Toledo, S., & Sanchez, V. (2020). the Technological Challenge Facing Higher Education Professors: Perceptions of ICT Tools for Developing 21st Century Skills. https://www.mdpi.com/2071-1050/12/13/5339

Liu, X., Zhang, S., & Wang, X. (2022). Building a professional learning community for teachers: A case study of integrating ICT in teaching. Educational Technology Research and Development, 70(2), 615-634.

Livingstone, S. (2018). Children: Data, privacy, and policy. Journal of Media Literacy Education, 10(1), 21-35.

Martin, F., & Bolliger, D. (2018, March). Engagement Matters: Student Perceptions on the Importance of Engagement Strategies in the Online Learning Environment. https://eric.ed.gov/?id=EJ1179659

Mlambo, G., & Mdhlalose, D. (2023). Integration of Technology in Education and its Impact on Learning and Teaching.(PDF) Integration of Technology in Education and its Impact on Learning and Teaching (researchgate.net)

Mijares, B. (2022). Teachers' Information and Communication Technology Competencies: Basis for a Competency-based Training Plan. American Journal of Educationa and Technology.

Merillo, J., & Dominggo, P. (2019). Technology in Pedagogy: Teachers' Perception Towards the Effectiveness of ICT Integration in LanguageTeaching.https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3442432

Mittha, C. (2021). 7 benefits of technology in the classroom. https://blog.ado be. com /en/publish/2021/08/23/7-benefits-of-technology-in-the-classroom #:~:text=Used%20well%2C%20classroom%20and%20administrative%20technologies%20can%20be,making%20learning%20more%20fun%2C%20and%20enhancing%20student%20outcomes.

Nasir, M. (2023, January). The Role of Technology in Lesson Planning. https://www.edulize.com/technology-in-lesson-planning/

Orbeta, A. C., Jr., & Paqueo, V. B. (2019). The Impact of Training on the Productivity of Workers in the Philippines. *Philippine Institute for Development Studies Discussion Paper Series, 2019-01*.

Rambo-Hernandez, K. E., Peters, S. J., & Plucker, J. A. (2019). Quantifying and exploring elementary school excellence gaps across schools and time. *Journal of Advanced Academics, 30*(4), 383–415.

Raneses, J., & Reyes, J. (2019). The Effectiveness of Mobile-Assisted Language Learning (MALL): A Review of the Extant Literature. https://www.researchgate.net/publication/345729778_The_Effectiveness_of_MobileAssisted_Language_Learning_MALL_A_Review_of_the_Extant_Literature

Reyes, J., Grajo, J., & Comia, L. (2021). Assessment of Filipino Higher Education Students' Readiness for e-Learning During a Pandemic: A Rasch Technique Application | Request PDF (researchgate.net)

Rita Hartman, M. B. (2019). Educators' perceptions of technology integration into the classroom: a descriptive case study. https://www.researchgate.net/publication/333790679_Educators'_perceptions_of_technology_integration_into_the_classroom_a_descriptive_case_study

Rivera, M. (2019). Overcoming Challenges and Promoting Positive Education in Inclusive Schools: A Multi-Country Study. *Education Sciences, 14*(11), 1169.

Rodriguez, M., & Santos, P. (2019). Professional Development in ICT: Addressing Teacher Needs. *International Journal of Education and Development using ICT, 15*(2), 56-72.

Rombaoa, J. (2019). ERIC - EJ1222866 - The Cost of Technology Integration on Filipino Families with Children Enrolled in Public Schools, Asia Pacific Education Review, 2019-Jun

Rosales, L. (2021). Technology Integration: Implication for Teachers' Professional Development.https://papers.iafor.org/wp-content/ uploads/ papers/seace2021/SEACE2021_59677.pdf

Saal, E., van Ryneveld, L., & Graham, M. A. (2022). https://eric.ed.gov/?q=omparing+the+Relationship+between+Using+Educational+Technology+in+Mathematics+and+Student+Achievement+in+South+Africa+and+Germany&id=EJ1367863

Sánchez, J., Salinas, Á., Contreras, D., & Meyer, E. (2020). Does the new digital generation of learners exist? A qualitative study. *British Journal of Educational Technology, 42*(4), 543-556.

Sara, P. (2022). Systemic Model for Technology Integration in Teaching. https://eric.ed.gov/?q=technology+integration+in+the+philippine&id=EJ1329354

Sameed, A., Akram H., & Abdelrady, A. (2022) .(PDF) Teachers' Perceptions of Technology Integration in Teaching-Learning Practices: A Systematic Review (researchgate.net)

Simin Ghavifekr, W. A. (2017). Teaching and Learning with Technology: Effective ness of ICT Integration in Schools. https://files.eric.ed.gov/fulltext/EJ11 05224.pdf

Singh, R. (2019). Barriers of Technology Integration in Teaching English. https://www.ijarbas.com/wp-content/uploads/2019/08/2-2-Barriers-of-technology-integration-in-teaching-English.pdf

Soncin, M., & Cannistra, M. (2021). Data analytics in education: are schools on the long and winding road? https://www.emerald.com/insight/ content/doi/10.1108/QRAM-04-2021-0058/full/html

Stewart, R., Wright, B., Smith, L., Roberts, S., & Russell, N. (2021). Gendered stereotypes and norms: A systematic review of interventions designed to shift attitudes and behaviour. *Heliyon, 7*(4). https://doi.org/10.1016/j.heliyon.2021.e06660

Suneetha, E. (2020). ROLE OF TEACHERS AS FACILITATORS IN LEARNING.http://www.rjelal.com/8.S1.2020/7172.pdf#:~:text=Currently%2C%20the%20role%20of%20teachers%20in%20the%20classroom,and%20learning%20tends%20to%20focus%20on%20the%20teacher.

Tobias Ley, K. T.-M.-V. (2021). Adopting technology in schools: modelling, mea suring and supporting knowledge appropriation. https://www.tandfonline. com/doi/full/10.1080/02619768.2021.1937113

Tomaro, Q. P. (2018). ICT integration in the educational system of Philippines. (PDF) ICT integration in the educational system of Philippines (research gate.net)

Tondeur, J., van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2020). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. Computers & Education, 144, 103697.

Toquero, C. M. (2020). Challenges and Opportunities for Higher Education amid the COVID-19 Pandemic: The Philippine Context. Pedagogical Research, 5(4), em0063. https://doi.org/10.29333/pr/7947

Tria, J. Z., (2020). The COVID-19 Pandemic through the Lens of Education in the Philippines: The New Normal. International Journal of Pedagogical Development and Lifelong Learning, 1(1), 2001. https://doi. org/10.30935/ijpdll/8311

Ukpong, E. G. (2023). Scholastic Analysis of the Impact of Digital Technologies on the Accountancy Profession in Nigeria. eajournals.org/ejaafr/wp-content/uploads/sites/16/2023/06/Scholastic-Analysis.pdf

Umali, T. (2019). EXCLUSIVE: Promoting Digital Literacy in the Philippine education system. EXCLUSIVE: Promoting Digital Literacy in the Philip pine education system – OpenGov Asia

UNESCO (2020). Global Trends in Teacher Gender Representation and ICT Use.

UNESCO. (2023). Information and communication technology (ICT) in education. https://learningportal.iiep.unesco.org/en/issue-briefs/improve-learning infor mation-and-communication-technology-ict-in-education

UNESCO. (2023). Digital learning and transformation of education. https://www .unesco.org/en/digital-education

UNESCO. (2023). The Power of Inclusive Education :Creating Opportunities for
All. The Power of Inclusive Education: Creating Equal Opportunities for All (smartcourses.io)

University, A. (2020). How Important Is Technology in Education? Benefits, Challenges, and Impact on Students: https://soeonline.american .edu/blog/technology-in education/#:~:text=By%20integrating%20techno logy%20into%20existing%20curricula%2C%20as%20opposed,improve%20their%20lesson%20plans%2C %20and%20facilitate%20personalized%20learning

Van Deursen, A. J., & Van Dijk, J. A. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. New Media & Society, 21(2), 354-375.

Van Dijk, J. A. (2020). The digital divide. Polity Press.

Watterston, Y. Z. (2021). The changes we need: Education post COVID-19. https://link.springer.com/article/10.1007/s10833-021-09417-3

Wijayasundara, M. (2020). Integration of ICT in teaching and learning in schools. (PDF) Integration of ICT in teaching and learning in schools (researchgate.net)

© GSJ