TECHNOLOGICAL CAPABILITY AND TEACHING PROFICIENCY OF MATHEMATICS TEACHERS IN USING INFORMATION AND COMMUNICATIONS TECHNOLOGY-BASED INSTRUCTION

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ABSTRACT

This quantitative study examined the technological capability and teaching proficiency of *40* Mathematics teachers in using ICT-based instruction, with a gender distribution of 47.5% female (19) and 52.5% male. An adapted and revised questionnaire was used along with the checklist as main instrument to gather the needed data. The results showed that Mathematics teachers have a highly capable level of technological capability, with a mean score of *4.28*. The level of teaching proficiency in using ICT-based instruction was also high, with a mean score of *6.13*, which is regarded as Consolidating. Furthermore, there was a weak positive linear relationship between the level of technological capability and the level of teaching proficiency in using ICT-based instruction. Mathematics teachers have a positive view of technology in their teaching, but technological capability varies among age groups, with younger teachers having higher levels. Schools are recommended to provide professional development programs for older teachers to enhance their technological skills. The study suggests that Mathematics teachers should also improve their proficiency in using ICT-based instruction to enhance teaching effectiveness. Providing professional development programs can assist teachers in integrating technology effectively into their instruction.

Keywords: *Technological capability, Teaching Proficiency, ICT-Based Instruction*

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-CMP-

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THE PROBLEM AND ITS SETTING

Introduction

This era is characterized by the prevalence of information and communication technologies (ICT). One simply cannot overestimate the significance that technology plays in the modern world. The enhancement of the educational system makes opportunities available to teachers, and it encourages students to modify the ways in which they learn. The current educational system requires all teachers to have adequate knowledge of various forms of technology. It is essential for educators to not only possess the technical skills necessary to independently create instructional materials but also the imaginative capacity to do so.

Technological advancement in teaching and learning methods has been the most noteworthy progress and innovation of the 21st century. Acknowledging the importance of information and communication technology (ICT) in education and society, it is essential to identify potential hindrances to its integration in educational institutions. This initial step can significantly improve the quality of teaching and learning (Buison, 2014).

There have long been issues with Mathematics instruction at the primary, secondary, and collegiate levels. It is often acknowledged that the study of Mathematics is among the most useful and important disciplines that are included in the curriculum of a typical school, and this sentiment is shared by the majority of people. The students of today have a widespread perception that Mathematics is an uninteresting subject that is also difficult and tiresome to study. It is possible that employing more on-board write-ups and attachable visual aids, which are considered to be traditional teaching methods, will assist in reviving the interest of the students, also known as “Gen Z.” The perspective of learners on learning may have a link to ICT-based instruction, not only from the point of view of the students, but also from the point of view of those who are responsible for implementing the K-12 curriculum in the Department of Education (Wanjala, Aurah, & Symon, 2015).

The necessity to prevent students from becoming discouraged, opposed to, or even antagonistic toward math as a topic, or, in some situations at least, the math instructor themselves, is the central point of disagreement in discussions about primary Mathematics education. It is clear that the best course of action to adopt is to make every attempt to stimulate the learner's interest in the subject if the teacher and everyone else involved must avoid choosing this course of action (Iwuanyanwu, 2021).

The academic performance of students and their attitudes toward the learning process both stand to benefit from technology in its current form, which has the ability to have a positive impact on both of these factors (Eyyam & Yaratan, 2014).

The incorporation of technological advances into our routines is becoming increasingly common. Instead of trying to deny the existence of this fact, educators would be better served by embracing technological advancements in the classroom. One could investigate the many different technological teaching aids that are available and assess how effective they are in a classroom setting. As a direct result of growing exposure to technology at earlier ages of children, it is extremely required to develop the skills necessary to adjust to changes in attention spans of children as well as changes in their learning styles. This is absolutely necessary.

Eyyam and Yaratan (2014) stated that educating students who come from a variety of racial and cultural backgrounds is one of the “profession-trials” that teachers face. This challenge is at the forefront of all education initiatives being undertaken across the country. The current age is one in which technology tools for education are available and are widely used in the classroom instruction of a number of subject areas. These instruments are widely employed in the classroom instruction of the current era. To achieve parity and proficiency with the use of Mathematics education assistive technologies, each and every Mathematics educator needs to have a working knowledge of these “techno-tools.”

Despite all the progress made in the field of education with regard to ICT tools, some areas in Malapatan municipality still do not fully utilize these tools since there is a lack of nearly all the equipment required to permit technological innovation in teaching and learning. Some of the teacehes wanted to teach Mathematics traditionally because of the factors hindering the use of technology in their respective stations. Due to these hindrances, like internet connectivity, lack of hands-on training incorporated with technology, and the hesitation of using gadgets and devices, some of the Mathematics teachers prefer to use traditional methods of teaching.

It has been discovered that teaching students through information and communication technology (ICT) maximizes the ability of the students for learning. The students agree that ICT-based instruction is more appealing than traditional teaching aids used by the teachers. However, according to the observation of the researcher, math teachers in Malapatan districts typically use education that is based on ICT for a variety of reasons. One of these reasons is the fact that the devices that are provided to public schools are typically not very functional and have damage both internally and externally. The researcher wanted to gain a better understanding the level of technological expertise possessed by both high school Mathematics teachers and students. In addition, the researcher aimed to investigate into the relationship between the technological capability and teaching proficiency of the 40 Mathematics teachers in using ICT-based instruction. The objective was to examine how this relationship affects the instructional approaches of these teachers. The ultimate goal was to acquire a more comprehensive understanding of the dynamic relationship between technology and education in secondary schools, particularly in the context of Mathematics classrooms.

Statement of the Problem

This study aimed to find out the technological capability of Mathematics teachers and its relationship with their proficiency in teaching high school Mathematics in central schools of Malapatan municipality.

Specifically, it answered the following questions:

1. What is the profile of Mathematics teachers in terms:
   1.1. Sex; and,
   1.2. Age?
2. What is the level of technological capability of the Mathematics teachers?
3. Is there a significant difference in the level of technological capability of Mathematics teachers when grouped according to:
   3.1. Sex; and,
   3.2. Age?
4. What is the level of teaching proficiency of the Mathematics teachers in using ICT-based instruction?
5. Is there a significant difference in the level of teaching proficiency in using ICT-based instruction among Mathematics teachers when grouped according to:
   5.1. Sex; and,
   5.2. Age?

6. Is there a significant relationship between the level of technological capability and the level of teaching proficiency in using ICT-based instruction among Mathematics teachers?
7. From the perspective of a Mathematics teacher, how does the technological capability translate to their teaching proficiency in using ICT-based instruction?

Hypotheses

The following hypotheses were tested using a *0.05* level of significance:

H_{01}: There is no significant difference in the level of technological capability among Mathematics teachers when grouped according to sex.

H_{02}: There is no significant difference in the level of technological capability among Mathematics teachers when grouped according to age.

H_{03}: There is no significant difference in the level of teaching proficiency in using ICT-based instructions among Mathematics teachers when grouped according to sex.

H_{04}: There is no significant difference in the level of teaching proficiency in using ICT-based instructions among Mathematics teachers when grouped according to age.

H_{05}: There is no significant relationship between the level of technological capability and the level of teaching proficiency in using ICT-based instructions among Mathematics teachers.

Significance of the Study

The results of this study may be significant to the following:

District Heads and School Administrators. It is possible that the data and inferences drawn from this study may serve as a source of motivation for them in their search for a wide variety of additional ICT-related facilities, such as desktop computers, projectors, and audio-visual equipment. There is a chance that things may work out well for them as a result of this turn of events. In conclusion, this may serve as a guiding concept for the selection of certain technological instruments that the school may choose to fund in the future. However, this is by no means the least important point.

Mathematics Teachers. This research has the potential to assist individuals in becoming more effective and knowledgeable in the use of a variety of instructional strategies, particularly the application of ICT-based learning. In addition, this may serve as a resource for selecting suitable resources for the efficient application of technological tools in educational settings. This research may provide a straightforward method of evaluating students' grasp of mathematical principles so as to serve as a channel.

Information and Communication Technology (ICT) may equip teachers with essential tools and resources to modify their instructional methodologies, promote self-directed learning among students, and encourage active participation of students in exploring mathematical concepts and themes.

Students. They may be provided with sufficient information to comprehend mathematical concepts as a result of this research. Using a variety of technological tools, this could help them have a better grasp on a variety of mathematical concepts and theories, allowing them to better understand Mathematics. This may engage their interest as individuals and encourage them to partake in the discussion more actively. Students can make the process of teaching and learning more engaging, enjoyable, and meaningful for themselves by utilizing a number of technological tools, which which they can use as they advance through a variety of mathematical subjects. This can help students develop the mathematical thinking skills necessary to make the teaching and learning process more meaningful to them. In addition, by using this research, students may be pointed in the direction of a variety of fascinating mathematical applications.

Researcher. The findings of the study may provide the researcher with information that she can use to improve her teaching methods. In addition to this, the researcher may benefit greatly from locating different approaches to the teaching of Mathematics. She may also gain a better understanding of the significance of appropriately navigating interactions with students and contemporary technologies as a result of this. The findings may provide the researcher with direction in how mathematics teaching and learning process should be carried out. Additionally, because of this, the researcher may be effective educator for the learners of this generation.

Other Researchers and Future Studies. This research may be of great value to those persons who are interested in gaining a better understanding of the teaching competency in connection to education that is based on information and communication technology (ICT). By examining various aspects and factors related to education, this study may provide additional material and evidence that can contribute to the development of robust standards and benchmarks for assessing educational quality.

Scope and Limitations

This study aimed to examine the technological capability of Mathematics teachers and its relationship with their proficiency in teaching Mathematics in high schools across three (*3*) districts in Malapatan, under the Division of Sarangani, during the academic year 2021-2022. The respondents of this study comprised forty (*40*) teachers, including twenty-one (*21*) male teachers and nineteen (*19*) female teachers, who were actively teaching Mathematics in National High Schools and selected Integrated Schools within the Malapatan Municipality. The study was conducted throughout the fourth quarter of the school year 2021-2022.

Chapter II

REVIEW OF RELATED LITERATURE

This chapter presents the conceptual framework and review of related literature and studies. The researcher reviewed several studies and literature on technological capability of Mathematics teachers and its relationship with their proficiency in teaching Mathematics in high school.

Theoretical Framework

There are many factors that contribute to successful integration of technology, but the ability of teachers to modify activities including instructional technology to meet the need of their students is the single most important one.

The study is based on the Technological, Pedagogical, and Content Knowledge (TPACK) paradigm developed by Kurt (2018). The ability to make use of emerging technologies is how this paradigm characterizes technological knowledge. In order to highlight the key differences between TPACK and PCK, the definition is constrained to focus only on developing technologies. By referring to these types of developments as "emerging technologies," the researcher hopes to limit the scope of the discussion to technological advancements that have not yet become prevalent in the environment. For example, in the past, people considered books to be a form of technology because they were perceived to be more practical than scrolls and to hold more information. After a few hundred years, books have become so commonplace that no one considers it to be a technological achievement anymore (Kurt, 2018).

Integrating technology in the classroom can aid students in building upon their prior knowledge and skills to generate new ideas and concepts. This can be achieved through the application of recalled and comprehended knowledge in real-world learning environments.

ICT-Based Instruction

The word "technology" comes from the Indo-European word "tek," which originally referred to the process of making wooden constructions. This is where our English word "technology" comes from. The Greeks of the sixteenth century B.C. used the term "techne," which referred to the method by which something was created, to describe the production process. In the eighteenth century, German academics were the ones who first used the term "technologies," but by the nineteenth century, the word had been altered to "technology." The Massachusetts Institute of Technology was the institution that coined the term "technology" in the 1850s. Subsequently, the term gained popularity and began to be used more generally (Buison, 2014).

According to Fu (2013), ICT has a tendency to increase educational access. Information and communication technology (ICT) enables students to learn at their own pace and convenience, regardless of time and location. Take, for instance, the fact that students enrolled in online classes are able to gain access to the assigned readings and other materials 24 hours a day, seven days a week. Through the use of teleconferencing, it is possible for students and teachers to connect with one another in the same room at the same time. This makes the process of connecting with one another in the same room at the same time simple and convenient. Take, for example, the fact that the instructor can check in to the online class at any time, on any day of the week, in order to view all of the readings that have been assigned as well as any other resources that are available and no longer are learning and teaching just dependent on printed materials thanks to the support of information and communication technology (ICT). The internet is home to a wide variety of materials, and users can expand their knowledge through a variety of channels, including video clips, audio sounds, visual displays, and other modes of communication. The internet is also a central hub for global communication.

ICT may assist convert a classroom environment into a setting that is more learner-centered when teaching a variety of mathematical concepts, a teacher has demonstrated an understanding of the underlying scientific principle if the process of expressing concepts has been carried out appropriately (observation, concept idea, concept formulation) and if the teacher has adhered to the rules that must be satisfied in order to meet the requirements of the concept definition (appropriateness, content minimum, conciseness, naturalists, applicability, and contemporariness) (Buison, 2014).

Lessani, Yunus, and Abu Bakar (2017) suggested that utilizing problem-solving and discovery-based learning strategies can enhance Mathematics education and foster students' creativity to tackle real-life challenges. By engaging in discovery-based learning, students are given the opportunity to think critically and creatively.

Teaching and learning that is supported by technological resources can bring about many changes in educational institutions, changes that call for careful planning and policymaking. Both the researchers and the policymakers need to share the same understanding of the long-term strategy. According to Ghavifekr and Rosdy's (2015) findings, national policies related to information and communication technology (ICT) can serve various crucial purposes. These policies establish a reasoning, a set of objectives, and a vision for education systems in cases where ICT is incorporated in teaching and learning practices. Such policies benefit students, teachers, parents, and the general public of a country as they provide a clear direction for the operation of education systems. In addition to this, they offer a perspective on the operation of educational systems.

Proficiency of Teachers in Teaching High School Mathematics with the Use of ICT-Based Instruction. As discussed by Baya'a and Daher (2013) as mentioned by Das (2019), ICT is a promising practice in the Mathematics classroom; however, its effectiveness is largely determined by a number of factors, including the views that instructors have of their own abilities with ICT and their attitudes toward ICT. One of the most stimulating and satisfying elements of being a teacher is keeping up with the latest advancements in information and communication technology (ICT) and putting them to use in the classroom. Baydaş, Göktaş, and Tatar (2013) investigate the correlation among classroom mathematics, teachers' self-esteem and sense of control in the presence of ICT, and teachers' inclination to use ICT in their instruction. The research offers a comprehensive analysis of these factors, with the aim of shedding light on the impact of ICT integration on mathematics education. The study offers valuable insights into the effective use of technology in the mathematics classroom, highlighting the importance of teacher attitudes and practices.

According to the research that was carried out by Ünal (2017), it is abundantly clear that Mathematics instructors overwhelmingly favored methods that required less preparation and effort, such as “Question and Answer” and “Demonstration.” Less frequently used were methods like “Scenario” and “Case study,” which required more preparation and materials than other approaches.

The research of Basargekar and Singhavi (2017) highlights the significance of both manipulative and non-manipulative factors of teachers in shaping their perceptions of their own effectiveness in utilizing ICT while teaching Mathematics in classrooms. Karri and Sankar (2016) concluded that using mathematical software can be more effective than other instructional approaches in helping students understand mathematical concepts and logic.

Buison (2014) emphasizes the importance of incorporating technological tools in Mathematics education and explores the barriers, learning needs, and opportunities for Mathematics teachers to integrate ICT into their teaching. Ghavifekr and Rosdy (2015) found that professional development training and seminar programs for Mathematics teachers can enhance the quality of student learning. Therefore, it is crucial to consider various aspects of ICT integration, especially from the perspective of school management, regarding strategic planning and policy-making, given that educators get guidance and support in overcoming the barriers that stand in the way of their capacity to successfully incorporate information and communication technology (ICT) into the teaching and learning process. Furthermore, implementing technological equipment and resources in educational institutions can assist instructors in efficiently combining Information and Communications Technology (ICT) with traditional classroom teaching methods. This strategy improves the teaching and learning process while also encouraging the development of critical digital skills (Alghamdi, 2017).

Gender in Teaching Mathematics and Technological Competence

The concept of gender is a social construction that is determined by society. Researchers in the field have arrived at the conclusion that the concepts of sex and gender are conceptually separate from one another. They claimed that sex is permanent and physically determined, in contrast to the malleable and socially constructed nature of gender. On the other hand, researchers will most likely continue to make use of the words male and female to refer to the aforementioned groups. In light of this, the binary classification of either being a man or a female is what this line of inquiry considers to be the definition of gender (Hansen & Quintero, 2018).

According to the study of Itankan (2016), the type of engagement males involve themselves in (such as making bows and arrows, rolling tires, flying kites, and constructing vehicles, among other activities) affords them the opportunity to explore nature and acquire a better understanding of the world around them. Because of this, it is more likely that males will outperform their female counterparts in Mathematics and science when they are younger. This may be seen in their capacity to relate the events that the instructor recounts in either science or Mathematics class with the actions that they (males) had carried out in the house. This is a good indicator of their intelligence. Because of this, the female was at a disadvantage when it came to the degree of competency in Mathematics and science.

It is important to note that there is an abundance of research available on the gender gap in terms of technical competence focused toward educators. The one that indicated that male instructors had a better opinion of their own technological ability than female teachers do. This was discovered in comparison to another study that found the opposite (Itankan, 2016). In addition, the findings of the study indicate that the gender gap is still there, despite the fact that it is possible to narrow it. In a finding that seems to fly in the face of common sense, the research found that male educators, on average, rated their own technology abilities as “not competent,” while female educators, on the whole, judged that they possessed “capable” levels of expertise. However, the change that was seen did not have a statistically significant impact. In other words, there is no gender disparity in terms of technological competence with regard to the group that was researched, which consisted of language instructors who taught the topic Filipino. As a result, it may be deduced from the enumeration that the evidence is still inconclusive (Antonio, Probitchado, Ricohermoso, Saavedra, & de la Rama, 2020).

Students frequently have trouble concretizing abstract concepts when confronted with the difficulty of Mathematics, particularly when they are required to think about, develop, and analyze mathematical relationships and generalizations. This is especially true when students are asked to think about, develop, and analyze mathematical relationships and generalizations. On the other hand, technology has a significant part to play in the likelihood of these problems being solved. It does this by offering visualization and dynamic structural design tools (Baydaş, Göktaş, & Tatar, 2013).

Teachers must serve as role models of great academic performance for children, and positive connections with teachers can boost academic achievement. Teachers can boost the beneficial impact of student participation by providing assistance. Teachers play a vital role in promoting students in learning and engagement in Mathematics, particularly in higher grade levels where females frequently feel less competent than males. Teachers must foster a learning atmosphere that fosters confidence and competence, resulting in greater academic achievement and engagement (El-Emadi, Said, & Friesen, 2019).

Integration of Technology in Mathematics Teaching

Today, technological advancement is a fact. This fact is mirrored in our society, particularly in the domains of labor, social services, and education. This technological advancement simplifies, strengthens, and accelerates the completion of daily duties. The development of so-called information and communication technologies reflects technological advancement in the educational field. ICTs have a direct impact on the evolution of teaching and learning processes because they foster innovative pedagogical practices and create new learning environments.

As a result of incorporating technology into their lessons, instructors and educators regularly find themselves tasked with answering a great number of inquiries, particularly in the subject of Mathematics. Mathematics education incorporates a variety of technical instruments that may be applied in the process of instructing students on mathematical concepts. Students and instructors alike can realize their maximum educational potential by making use of the specialized tools that correspond to each subfield of Mathematics. The success of knowledge transfer to students depends on various factors, including the role of teachers in the teaching and learning process and the incorporation of technology to provide context (Drijvers, 2013). Many Mathematics teachers leverage modern technology and actively seek to integrate it into their teaching methods. Pleasurable experiences are crucial for effective learning, and technology is deemed an essential component of the enjoyment that Mathematics offers to learners. It is indisputable that instructing children in Mathematics just as a topic of practical importance does not interest or challenge them to the same degree as learning Mathematics with the assistance of technology does (Tomaro, 2018).

Gender in Teaching Proficiency using ICT-Based Instructions

Teachers, in their capacity as knowledge providers, play a crucial role in the process of incorporating technology into teaching and learning. This is particularly important when taking into account the fact that technology plays a significant role in the comprehension of Mathematics at all educational levels, from preschool to postgraduate study. It has been noted that teachers from kindergarten all the way up to grade 12 are employing technology to assist their students in better comprehending mathematical concepts. When it comes to the mathematical technology that is utilized in the classroom, there are those who believe that the educator is, and always will be, the single most significant aspect. It is possible to use it as an instructional tool that is helpful, just like any other tool; but it is also possible to use it in a way that is counterproductive. Students are able to acquire knowledge in a more efficient manner when their teachers make use of the appropriate resources. Select and develop suitable mathematical activities that maximize the advantages of technology and effectively enhance learning, including but not limited to graphing, visualization, and computation. This will allow teachers to maximize the utilization of students using these resources. These actions can be taken to optimize the benefits that can be received from technologies and the efficiency with which tasks can be completed (Alghamdi, 2017).

Integrating ICT in the Classroom Setting

Information and Communications Technology refers to the various ways that technology may be used to store, alter, and convey information. For the most part, the researcher will utilize this in the contemporary educational environment of the 21st century. ICT stands for information and communication technology, and it refers to things like computers, graphic calculators, and similar devices. However, this research places a greater focus on the usage of mathematical software in the classroom, which may be accomplished through the utilization of desktop computers, laptops, and/or cellphones.

Alemu (2015) stated that when students use technology in the classroom alongside the instructor, they are more involved in tasks that are socially important. In addition, he asserts that in order for educators to be successful in their jobs, they need to have a strong sense of dedication and focus on maintaining a personal connection with their students. In terms of day-to-day life, information and communications technology is present in many facets of society, including the economy, healthcare, and governance in addition to educational settings.

Even if its influence has not been very significant so far, information and communications technology (ICT) is gradually gaining acceptance in the classroom, just as it has in other fields. Because the use of several technologies in the area of education makes it possible to create classroom environments that are more learner-centered, there is an increased potential for conflict between teachers and students. The incorporation of information and communications technology (ICT) into the teaching and learning process is becoming increasingly important in our fast-paced world, despite the tensions that are produced by technology. This is because technology in education is continuing to expand and evolve in the twenty-first century.

The integration of information and communication technology (ICT) in the educational environment has been shown to have a significant impact on the effectiveness of teaching and learning, particularly in class sections where ICT-based instruction is used. The use of ICT by the teacher responsible for such sections enhances the teaching and learning process, making it more accessible and engaging for students. This highlights the importance of a comprehensive approach to the integration of ICT in both formal and informal education, as it can complement and improve the integration of ICT in teaching and learning. A study conducted by Jamieson-Proctor, Burnett, Finger, & Watson (2006), cited by Alemu (2015), demonstrates the various advantages that can be gained from this approach. Therefore, it is crucial for educators to explore different ways of incorporating ICT in education to enhance the quality of teaching and learning, improve accessibility, and promote more efficient and effective learning outcomes. This research emphasizes the need for educators to integrate technology into their teaching to facilitate a more engaging and interactive learning experience, particularly in class sections where ICT-based instruction is available (Alemu, 2015).

The development of technology has prioritized the use of dynamic representations, such as graphs, tables, and equations, that are linked together. Dynamic representations have been shown to be effective in helping students understand complex concepts. By using these representations, students can connect their intuitive understanding with formal mathematical concepts and bridge the gap between graphical and language-based understandings. The curriculum modules are designed to organize mathematical concepts and activities into user-friendly resources that combine paper-based and technology-based elements (Buison, 2014).

In addition, research conducted by Chien, Wu, and Hsu (2014) has demonstrated that students in schools have high expectations for the incorporation of ICT in the classroom. This is due to the fact that the current generation was born into a technological environment and has spent their entire lives surrounded by technology. This phenomenon is referred to as the digital-native phenomenon. The younger the students are, the higher their expectations are for the integration of information and communication technologies into the classroom. It also shown that human qualities, which are characterized as self-perceptions, have a significant impact on the integration of information and communication technologies. This study discovered that both instructors and students embrace the use of information and communications technology (ICT) both within and outside of the classroom, with both groups being more inclined to utilize technology outside of the classroom. They came to the conclusion that a lower proportion of ICT integration in the classroom was the consequence of teachers' lack of confidence, competence, and positive attitudes about the use of technology in the classroom (Chien et al, 2014).

Research Gap

The integration of technology in education, particularly in the field of Mathematics, has gained significant attention due to its potential to enhance student learning experiences. However, despite the growing interest and the implementation of information and communication technology (ICT) in the classroom, there are still notable research gaps that need to be addressed. This research gap section aims to highlight the areas that require further investigation and exploration, focusing on two key aspects: the integration of technology in Mathematics teaching and the role of gender in utilizing ICT-based instruction. By addressing these research gaps, we can gain a deeper understanding of how technology can be effectively incorporated in the classroom setting and how gender influences the proficiency and competence of teachers in utilizing ICT for Mathematics education.

Exploring the potential of integrating technology in the classroom based on the constructivist approach to education. The study emphasizes the need to bridge the research gap in understanding how technology can facilitate the application of prior knowledge and skills in real-world learning environments (Buison, 2014). The role of information and communication technology (ICT) in increasing educational access and flexibility for students. The research highlights the research gap regarding the need for further investigation into how ICT can support personalized learning and remove time and location constraints in education (Fu, 2013).

In their research, Lessani, Yunus, and Abu Bakar (2017) propose the potential of problem-solving and discovery-based learning strategies to enrich Mathematics education and foster students' creativity. Their study highlights a significant research gap, specifically focusing on investigating the effectiveness of these strategies in cultivating students' critical thinking abilities and enhancing their creative problem-solving skills within the domain of Mathematics. By addressing this gap, the research aims to contribute to the existing knowledge base, providing valuable insights into the pedagogical approaches that can effectively nurture students' cognitive development and promote innovative problem-solving capabilities in Mathematics education.

Baya'a and Daher (2013), as cited by Das (2019), highlight the significance of teachers' proficiency in utilizing ICT-based instruction in Mathematics classrooms. The study addresses the research gap in exploring the relationship between teachers' attitudes, technological abilities, and the effectiveness of ICT integration in Mathematics education. Examines the teaching methods preferred by Mathematics teachers and identifies a research gap in understanding the factors influencing their choices. The study emphasizes the need for further investigation into the preparation and effort required for different teaching methods and their impact on student learning outcomes (Ünal, 2017).

Basargekar and Singhavi (2017) highlight the importance of teachers' perceptions of their own technological effectiveness in utilizing ICT in Mathematics classrooms. The research emphasizes the research gap in understanding how these perceptions shape teachers' instructional practices and their impact on student learning outcomes. Another study emphasizes the effectiveness of mathematical software in enhancing students' understanding of mathematical concepts and logic. The research addresses the research gap in exploring the potential of technology-based instructional approaches in Mathematics education (Karri & Sankar, 2016). Also, Alghamdi (2017) emphasizes the need to consider various aspects of ICT integration, particularly from the perspective of school management and policy-making. The study highlights the research gap in understanding how strategic planning and policy-making can support teachers in overcoming barriers to successful ICT integration in teaching and learning.

Hansen and Quintero (2018) discuss the social construction of gender and the research gap in understanding the impact of gender on teaching Mathematics and technological competence. The study emphasizes the necessity of conducting additional research to explore the connection between gender, performance in Mathematics, and attitudes towards technology in greater depth. Exploring the gender gap in Mathematics and science education and highlights the research gap in understanding how different types of engagement and activities influence gender differences in competency. The study emphasizes the need for further research on the impact of early experiences on gender disparities in Mathematics and science education (Itankan, 2016). Antonio et al. (2020) examines the gender gap in technological competence among language teachers and identify an inconclusive research gap. The study emphasizes the need for further research to determine the extent of the gender disparity in technological competence among different academic disciplines.

Baydaş, Göktaş, and Tatar (2013) highlight the potential of technology, such as visualization and dynamic structural design tools, in helping students concretize abstract mathematical concepts. The research emphasizes the research gap in understanding how technology can support students' understanding and application of mathematical relationships and generalizations.

A descriptive correlation study was conducted to investigate the relationship between technological capability and teaching proficiency among male and female Mathematics teachers, in order to address an existing gap in the literature. Specifically, the study aimed to determine the significance of these factors. Isf this study were conducted in the context of the Philippines, with a focus on central schools in Malapatan Districts, it could have significant implications for the decision to incorporate policy decisions and improve teaching practices by identifying the factors that contribute to the effective integration of technology in Mathematics education.

Definition of Terms

The following concepts must be understood in order to properly cite:

Electronic Media. Electronic media are those in which the audience may access the material through the use of electronic or electromechanical methods. Examples of electronic media include the internet, mobile phones, and personal computers. Therefore, it refers to a desktop computer, a DVD player, an LCD Projector, an LED Television, a Tablet, and Laptop Computers that are supplied by the Division of Sarangani and Malapatan Districts for the use of the educators.

ICT-Based Instruction. E-learning is the process of gaining knowledge through the application of information and communication technologies, and its acronym stands for "online learning." The term "e-learning" can apply to the distribution of educational material in a range of formats, such as those based on the web, on computers, in videos, and so on. Access to more material can be gained through the use of the website known as E-Learning Study Skills Training with Proven Pedagogies.

Teaching Proficiency. The effectiveness of teaching is correlated to the level of competency of the students, which can be defined as supporting students in routinely obtaining significant mathematical knowledge. The capacity to work well with a broad group of students in a variety of venues and on a variety of mathematical topics is an essential component of adaptability, which is another requirement for proficiency.

An effective educator arrives (and departs) on time every single day, has a well-prepared lesson plan, instructional resources, engaged time on task, and everything is structured, regardless of the product or result. This instructor does a good job. Education is said to be efficient when the outputs of education, such as results and value-added, are achieved with the fewest resources possible (whether those resources are financial or something else entirely, such as the innate talent of students).

Technological Capability. Technological capability refers to the level of proficiency and expertise possessed by Mathematics teachers in utilizing tools such as interactive whiteboards, graphing calculators, educational apps, and software programs to enhance student engagement and understanding of mathematical concepts. Teaching proficiency in using ICT-based instruction is the competence demonstrated by teachers in employing Information and Communication Technology (ICT) tools effectively, enabling them to create dynamic and effective learning experiences for students. The utilization of these tools by teachers with high technological capability can contribute to greater success in Mathematics and beyond, as it enhances student engagement and understanding of the subject.

Conceptual Framework

This study is based on the Constructive Learning Theory, which emphasizes active learner involvement and knowledge construction. It views learners as active participants who engage with the subject matter, construct their own understanding, and integrate new information into their existing knowledge. Within this framework, the study aims to explore the intricate relationship between teachers' level of technological capability, their proficiency in teaching Mathematics using ICT-based instructions, and the perspective of Mathematics teachers on teaching proficiency in using ICT-based instruction. The independent variable in this study is the teachers' level of technological capability, encompassing their proficiency in utilizing specific technological tools such as desktop and laptop computers, smart/LED TVs, and LCD projectors. These tools are recognized as essential components of ICT-based instruction in the Mathematics classroom.

The study acknowledges that teachers' technological capability may vary due to factors such as their familiarity, training, and experience with these tools. Sex and age are considered as intervening variables within the conceptual framework. These variables acknowledge the potential influence of teachers' gender and age on their level of technological capability and proficiency in teaching Mathematics using ICT-based instructions. Differences in experiences, preferences, and attitudes towards technology utilization may arise between male and female teachers or among different age groups, potentially impacting their effectiveness in employing ICT-based instruction. The dependent variable in this study is the teachers' proficiency in teaching Mathematics using ICT-based instructions, which is evaluated through classroom observation tools. These tools, such as ratings from Classroom Observation 1 and Classroom Observation 2, align with the criteria outlined in the IPCRF KRA, which provides a framework for assessing teachers' individual performance and reviewing their key result areas. By employing these observation tools, the study aims to objectively measure and analyze teachers' proficiency in utilizing ICT-based instruction in the Mathematics classroom. Furthermore, the study incorporates the perspective of Mathematics teachers on teaching proficiency in using ICT-based instruction.

By exploring their experiences, perceptions, and attitudes towards integrating technology into their teaching practices, the study seeks to gain a comprehensive understanding of the factors that shape teachers' perspectives. This qualitative aspect of the research adds depth to the investigation, allowing for insights into the motivations, challenges, and potential benefits associated with the use of ICT in Mathematics education.

The conceptual framework serves as a guiding structure for exploring the interplay between teachers' technological competence and their aptitude in employing ICT-based instructions for teaching Mathematics. By incorporating intervening variables like sex and age, and taking into account the viewpoints of Mathematics teachers, this framework aims to uncover the factors that potentially impact teachers' capacity to integrate technology effectively into their instructional practices. Additionally, it seeks to gain a deeper understanding of how teachers perceive the role of ICT-based instruction in Mathematics education. Through this, the study endeavors to shed light on the complex dynamics surrounding technology integration in Mathematics teaching and provide valuable insights for educational practices.

Overall, this study has the potential to make a significant contribution to the field of Mathematics education by providing insights into the relationship between teachers' technological capability, their proficiency in using ICT-based instruction, and their perspectives on teaching proficiency within the context of ICT-based instruction in Mathematics education.

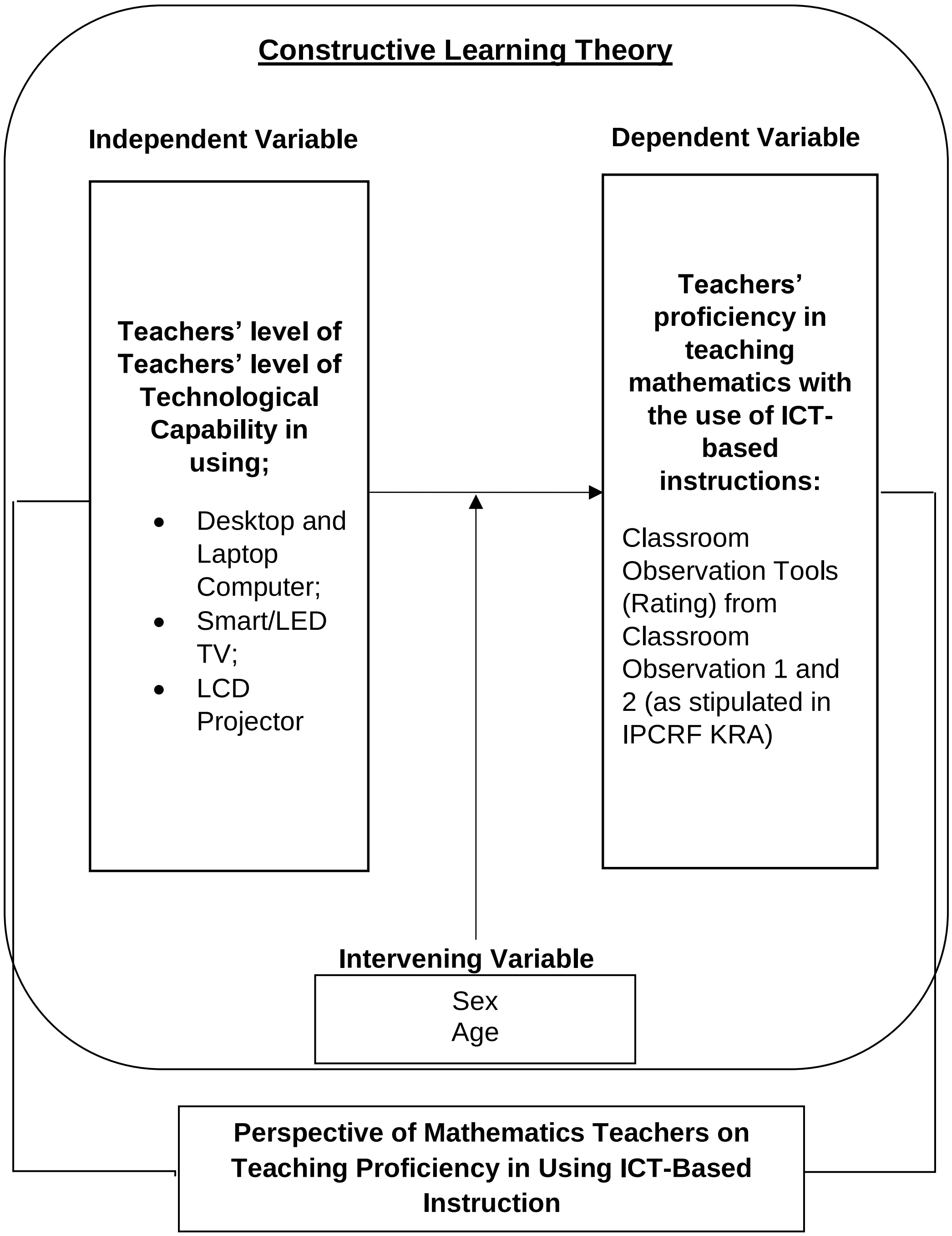

Figure 1. Conceptual Framework

Chapter III

METHODOLOGY

This chapter presents the research method and the procedures used in this study. It also includes the research design, research instrument, data gathering procedures, and statistical treatment that the researcher used for data analysis.

Research Design

The study used a mixed method approach, where both quantitative and qualitative data were collected and analyzed. The quantitative data was obtained through a survey that measured the accessibility of ICT-related devices such as desktop computers, portable computers, projectors, and LCD televisions and internet connectivity in high school Mathematics classrooms, as well as the proficiency and capability of teachers in using ICT-based instruction.

In order to explore the relationship between teachers' technological capability and their proficiency in using ICT-based instruction, this study employed qualitative methods. Specifically, in-depth interviews were conducted with Mathematics teachers to gain valuable insights from their perspective. These interviews served as a way to investigate and understand the perceptions of teachers regarding the use of ICT in the classroom and how it affected their teaching effectiveness. By examining the experiences and viewpoints of teachers, the study aimed to shed light on the connection between technological proficiency, ICT integration, and effective teaching practices. The study utilized qualitative research methods, specifically in-depth interviews, to investigate into the perspectives of Mathematics teachers regarding the correlation between their technological capability and teaching proficiency in ICT-based instructionThis qualitative method allowed for a comprehensive examination of the perceptions of the teachers as they utilized ICT in their classrooms and assessed the impact it had on their teaching effectiveness. The researcher conducted in-depth interviews with teachers to gain insights into their perspectives and experiences regarding the utilization of ICT in Mathematics education. These interviews aimed to gather detailed information and develop a comprehensive understanding of how teachers incorporated technology into their instructional practices. Thematic analysis, a widely employed qualitative research method, was utilized to identify recurring patterns and themes within the interview data. Through this analytical process, the study sought to generate valuable recommendations for the effective integration of Information and Communications Technology (ICT) in Mathematics education. Thematic analysis was conducted on data collected from a total of five (5) participants, enabling the identification of key patterns, themes, and core ideas. Based on these insightful findings, the study provided targeted recommendations to enhance the integration of ICT in Mathematics education, taking into account the perspectives of the participants.

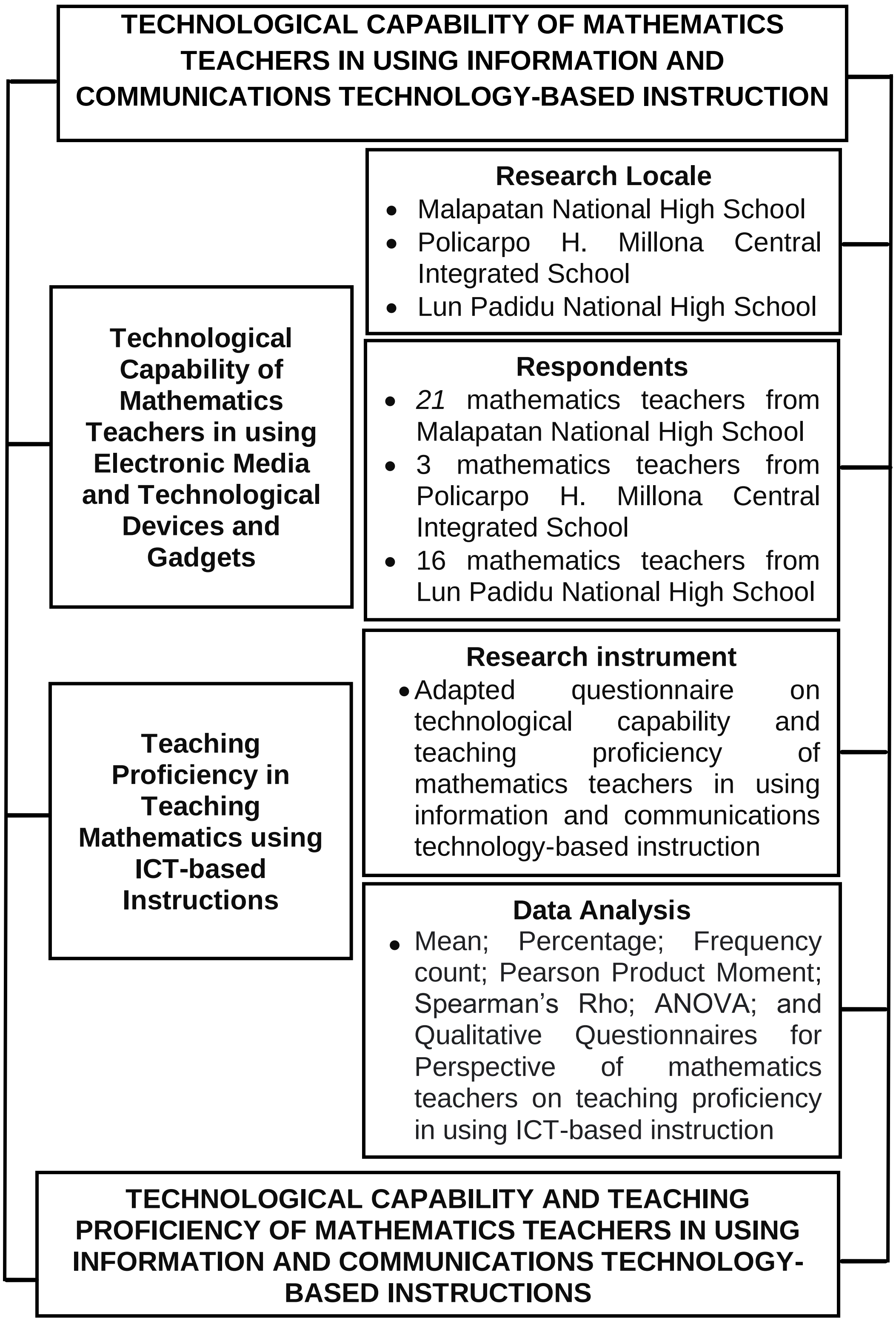

Figure 2. Research Design

Research Locale

The researcher carried out a comprehensive investigation by selecting three (*3*) central secondary schools situated within the Malapatan Municipality, namely Malapatan National High School, Policarpo H. Millona Central Integrated School, and Lun Padidu National High School. In this study, it is crucial to note that these schools are entrusted with the important responsibility of providing education and support to the enrolled students, and they operate under the jurisdiction and guidance of the Malapatan Municipality, Sarangani Division, and Sarangani Province, respectively.

Malapatan National High School, located in the heart of Poblacion Malapatan, is a public institution that serves as part of Malapatan 1 District. It is comprised of two separate site areas, namely Site B and Old Building Site, with a School ID of 304537. Policarpo H. Millona Central Integrated School, formerly known as Lun Masla Elementary School, is situated in Malapatan 2 District. Its establishment dates back to 1960 when the donation deed was approved, and it now bears the School ID 500284. The school is conveniently located near the Barangay Hall of Lun Masla. Lastly, Lun Padidu National High School, with the identification number 304531, caters to the educational needs of Malapatan 3 District. It is strategically positioned in the central part of Barangay Lun Padidu, making it easily accessible to the entire barangay community.

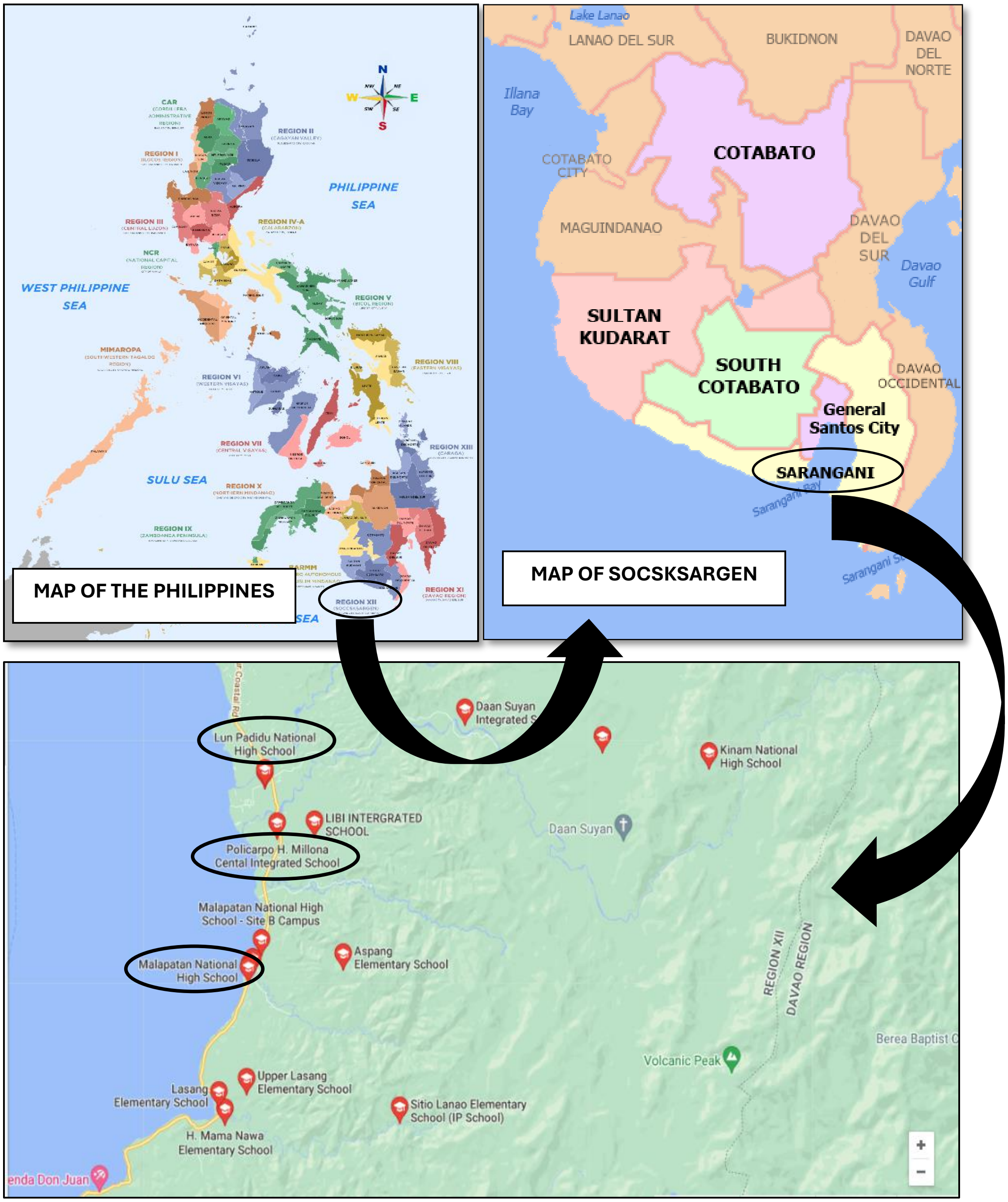

Figure 3. Map of the Locale of the Study

Respondents

Forty (*40*) high school Mathematics teachers were chosen as respondents of this study. They were provided with a questionnaire that had been altered for them to fill out. The high school teacher-respondents were selected through a comprehensive enumeration of those who had Mathematics as a subject load either in junior high school or senior high school during the school year 2021-2022 in Malapatan National High School, Policarpo H. Millona Central Integrated School, and Lun Padidu National High School respectively.

The distribution of respondents is as follows: Malapatan National High School had a total of twenty-one (*21*) respondents, with eleven (*11*) males and ten (*10*) females. Policarpo H. Millona Central Integrated School had only three (*3*) respondents, with one (*1*) male and two (*2*) females. Meanwhile, Lun Padidu National High School had a total of sixteen (*16*) respondents, with nine (*9*) males and seven (*7*) females.

The total number of participants in the study was 40, with 21 males and 19 females answering the survey. This gender distribution was almost equal, with a slight majority of male respondents.

Among the three selected schools, Malapatan National High School had the highest number of respondents, which accounted for more than half of the total number of participants. In contrast, Policarpo H. Millona Central

Integrated School had the smallest number of participants, with only three respondents.

The gender distribution across the schools varied, with Malapatan National High School having a balanced gender distribution, while Lun Padidu National High School had a higher number of male respondents. Policarpo H. Millona Central Integrated School had the lowest number of participants and had only one male respondent.

Research Instrument

The researcher adapted and revised a questionnaire and a checklist as main instruments to gather the needed data for this study and the researcher also used the IPCRF (Individual Performance Commitment and Review Form) pursuant to DepEd Order (DO) No. 2, S. 2015 or the Guidelines on the Establishment and Implementation of the Results-Based Performance Management System (RPMS) in the Department of Education.

In order to assess the proficiency of high school Mathematics teachers in teaching using ICT-based instruction, the researcher collected data from two Key Result Areas (KRAs) - KRA 1 and KRA 3. KRA 1 pertains to Content Knowledge and Pedagogy, specifically objective 2, which focuses on the positive use of ICT to facilitate the teaching and learning process. Meanwhile, KRA 3 pertains to Curriculum and Planning, particularly objective 7, which involves the selection, development, organization, and use of appropriate teaching and learning resources, including ICT, to address learning goals. The researcher collected the results of classroom observation from 40 participants in this study. These observations were conducted by their school administrators, who had already evaluated them in collaboration with master teachers.

Classroom Observation rating on Indicator 1and 3

Scale	Interpretation
3	Organizing
4	Developing
5	Applying
6	Consolidating
7	Integrating

In the context of classroom observation tool, Indicator 1 and Indicator 3 are evaluated using a scale that ranges from 3 to 7. This scale offers a clear interpretation of the teacher's performance based on their observed practices. A rating of 3 on Indicator 1 and Indicator 3 indicates that the teacher is proficient in organizing their instruction. This means that they effectively structure their lessons, set clear objectives, and create a conducive learning environment for their students. A rating of 4 signifies that the teacher is in the developing stage. They are actively working towards improving their instructional practices and are showing progress in organizing their lessons and classroom management. When a teacher receives a rating of 5, it indicates that they have reached the stage of applying their knowledge and skills in the classroom. They demonstrate the ability to effectively implement instructional strategies, engage students in meaningful learning activities, and manage the classroom environment. A rating of 6 suggests that the teacher is at the consolidating stage. They have successfully integrated various teaching techniques, strategies, and resources to promote student learning and achievement. The teacher demonstrates consistency in their instructional practices and continually seeks ways to refine and enhance their teaching approaches. Lastly, a rating of 7 signifies that the teacher has reached the highest level of performance, which is integrating. At this stage, the teacher seamlessly integrates different instructional methods, technologies, and resources to create a holistic and student-centered learning experience. They exhibit exemplary teaching practices that foster critical thinking, problem-solving, and independent learning among their students. By using this scale and interpretation, the Guidelines on the establishment and implementation of the results-based performance management system provide a standardized and objective means of assessing and evaluating teachers' instructional practices during classroom observations. It ensures a fair and comprehensive evaluation process, leading to continuous improvement and professional development among educators.

After the quantitative data collection, a qualitative research approach was employed using an interview guide to explore the experiences and perceptions of five (5) Mathematics teachers in utilizing ICT in the classroom and how this impacted their teaching effectiveness. Through in-depth interviews, the researchers gained insights into the subjective experiences of the teachers, which provided a deeper understanding of their perspectives on the use of ICT in Mathematics education.

The combination of quantitative and qualitative data provided a comprehensive understanding of the relationship between ICT accessibility and teacher efficacy in the context of Mathematics education. The integration of these two methods allowed the researchers to provide recommendations for improving the integration of ICT in Mathematics education, based on both objective measurements and subjective experiences of the teachers.

In this study, a five-point scale ranging from one (1) to five (5) was employed to assess and understand the technological capability of the respondents. The scale was designed to represent a range of proficiency, with a rating of one indicating the highest level of technological capability and a rating of five representing the lowest level. Specifically, a rating of one denoted the ability to proficiently perform advanced technological tasks, while higher ratings indicated a decreasing level of competence. This scale enabled the researcher to quantify and evaluate the technological competence of the respondents in a straightforward and easily interpretable manner, facilitating a clear understanding of their aptitude in various technological aspects.

Mean Range	Description	Interpretation
4.51-5.00	Very High	The respondent is able to correctly perform all of the required technological tasks.
3.51-4.50	High	The respondent is able to correctly perform most of the required tasks but failed to perform one of the required technological tasks.
2.51-3.50	Moderate	The respondent was able to correctly perform some of the required tasks but failed to perform two of the required technological tasks.
1.51-2.50	Low	The respondent was able to correctly perform a few of the required tasks but failed to perform three of the required technological tasks.
1.00-1.50	Very Low	The respondent is not able to correctly perform all of the required technological tasks.

Data Gathering Procedure

In order to get permission to conduct the research on the respondents, the researcher physically delivered the letter of permission to the Schools Division Superintendent – Division of Sarangani, the Public Schools District Supervisor, and the School Principals – Malapatan Districts. Once approval was granted, the instrument for collecting data that had been approved, along with a cover letter that assured respondents that the confidentiality of their responses would be maintained, were distributed to department heads who assisted the researcher in carrying out the survey. The researcher adhered to a timetable to gather data, and the questionnaires were retrieved and analyzed as soon as they were filled out. To obtain information on the IPCRF, the researcher sent a letter to the administrators of the teachers' individual schools requesting the most recent copy of the IPCRF from those teachers. Counts were taken, and the information was compiled to be ready for statistical analysis. The data served as the basis for the extraction and analysis of the findings. The data was analyzed to draw conclusions and make suggestions based on the findings of the study.

Data Analysis

Inferential statistics was applied to the data that was obtained after being analyzed using descriptive statistics in order to develop conclusions and generalizations about the data. In order to make sense of the data gathered from the ICT-based facilities offered by the institution, the study used frequency and percentage.

Mean, and weighted mean were used to determine the level of teacher's technological capability in teaching High School.

T-tests for independent samples was performed to see if there is a significant difference in the level of technological capability of teachers when they are grouped based on gender.

Mean, and weighted mean were used to determine the level of teaching proficiency of the Mathematics teachers in using ICT-based instruction.

T-test for independent samples was used to determine if there exists a significant difference in the level of teaching proficiency in using ICT-based instruction among male and female Mathematics teachers.

Pearson R product-moment correlation was used to determine the significant relationship between the level of technological capabilities of the teachers and the level of teaching proficiency in using ICT-based instruction.

In the process of assessing the qualitative data, thematic analysis was utilized. The researcher was able to identify patterns of response during the interview by having the participants write their responses on the questionnaire that was provided to them. The data was analyzed in great detail by the researcher in order to find recurring topics, concepts, and semantic patterns that are referred to as common themes.

Thematic analysis is a method of analyzing qualitative data that involves identifying and analyzing patterns, themes, and concepts within the data. When using frequency of responses, thematic analysis involves counting the number of times that a particular theme or concept appears in the data.

In “typical”, the researcher would go through the data and count the number of times that this word or a similar word (e.g., "common," "usual," "regular") appears. The frequency of these responses would provide an indication of how often this theme is present in the data.

Similarly, if the theme is "general," the researcher would count the number of times that this word or a similar word (e.g., "broad," "comprehensive," "overall") appears in the data. Again, the frequency of these responses would provide an indication of how often this theme is present in the data.

By analyzing the frequency of responses for each theme, the researcher gained a better understanding of the patterns and concepts that are present in the data, and used this information to draw conclusions and make recommendations.

Ethical Considerations

The researcher made sure to adhere to the ethical guidelines set by Holy Trinity College to prevent any unintentional exploitation or mistreatment of the individuals being researched.

Due to the fact that this is a pandemic, meetings by appointment, with the approval of school administrators, were strongly encouraged. On the other hand, due to the fact that Malapatan National High School, Policarpo H. Millona Central Integrated School, and Lun Padidu National High School are all Covid-free institutions, the researcher was able to identify and collect the respondents at their respective schools. The researcher did not use any coercion or threats to get respondents to fill out the questionnaire, and they guaranteed that all of the respondents' personally identifiable information would be kept private. The procedures were followed precisely throughout the study.

Informed Consent. Prior to their participation, prospective respondents were provided with background information on the objectives of the study, its procedures, and the advantages that might arise from their participation. The respondents were made aware of their voluntary right to participate and withdraw from the study at any time. They were also informed that they could choose to withhold information, and that the information they provided would be kept confidential. Furthermore, they gave their full consent to participate in the study. In order to boost the number of people who took part in the study, the researchers did not use any form of pressure or inducement of any kind. The authorization form was given personally to each individual who participated in the survey by the researcher.

Voluntary Participation. When determining whether something is completely voluntary, it is necessary to take into account the financial situations of possible participants in order to determine what kind of safety precautions should be taken in order to safeguard the exercise of free will. This is done in order to determine which kind of safety precautions should be taken in order to ensure that free will is not compromised. The amount of effort that must be put forth in order to define voluntariness varies, and this is because it is reliant on a variety of distinct aspects. One of these facets is the respondents' ability to resist being influenced by monetary incentives, bureaucratic leadership, or other means. When respondents in a survey have a limited opportunity to decline, further caution and attention are required to prevent any additional stress from being added (both real and perceived).

Data Privacy. The fact that the research instrument contained all of the information that was required for the study meant that requesting authorization to access private material was not a prerequisite for carrying out the inquiry. The confidentiality of any and all information that may be directly or indirectly related to a participant was maintained at the highest possible level. It has safeguards in place to stop unauthorized access, use, or alteration of any kind, as well as theft and loss of any sort. Both the personal cabinet that the researchers use, which was securely closed, and the information that was gathered will be stored on a computer that requires a password in order to access it was kept in a secure location.

The researcher has the ability to disclose their identity by making use of either the informed consent form or the research instrument and make sure that the participants' anonymity was protected throughout the whole process of data collection, presentation, and publication by providing them with a numerical code anytime they contributed information that may be used to identify them. In the report, it provided a synopsis of the findings that were obtained during the inquiry. A confidentiality declaration was included within the document in which the participants' informed consent was requested by the researcher so that the participants' right to privacy could be protected. In addition to having all of its data and any research tools that were used to run it shredded, the system was meticulously cleaned.

Gender Sensitivity. In this study, it was found that gender equality was observed among both male and female participants. The researcher, along with the other respondents and the school superintendent, treated all respondents with equal respect. The survey was meticulously designed to prioritize gender equality, ensuring that none of the questions contained any potential errors or biases. The commitment to creating an inclusive and unbiased survey reflects the strong emphasis placed on gender equality throughout the study.

Cultural Sensitivity. The researcher maintained objectivity and acknowledged the potential for misinterpretation among the respondents due to cultural sensitivity. To address this concern, it was proposed that participants enhance their understanding and communication skills by gaining a deeper knowledge of cultural concepts. This would enable them to engage in more effective communication with one another. The importance of this suggestion lies in the need to ensure that research participants are familiar with the language and concepts employed in the study, enabling them to provide meaningful and accurate responses. By encouraging participants to enhance their cultural knowledge, the study aims to foster clearer and more precise communication within the research context.

Chapter IV

PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter presents the results of the data gathered, the analysis, and the interpretation of this study. The results technological capability of Mathematics teachers and its effect on teaching proficiency of Mathematics teachers in central schools of Malapatan municipality are presented in the succeeding tables.

The Profile of Mathematics Teachers

Tables 1.1 and 1.2 present the sex and age profiles of the teacher respondents.

Table 1.1

Profile of Mathematics Teachers in Terms of Sex

Levels	Frequency	% of Total	Cumulative %
Female	*19*	*47.5 %*	*47.5 %*
Male	*21*	*52.5 %*	*100.0 %*

Table 1.1 shows that *19* female and *21* male math teachers participated in the survey. This survey has *52.5%* male Mathematics teachers and *47.5%* female teachers. The result implies that the research conducted in classes with male teachers as opposed to classrooms with female teachers has produced inconsistent results when examining whether or not the gender of the teacher has an influence on the students' ability to learn. If anything, the

expectations of teachers seem to favor males over females (at least in Mathematics), as teachers routinely underrate the ability of female until they demonstrate that they have worked hard to improve themselves. It appeared that female teachers had the most successful relationships with all of their students, irrespective of the gender of the learners. Therefore, it is difficult to say if encouraging more gender diversity among all teachers will in any way contribute to an improvement in the academic performance of males (Hansen & Quintero, 2018).

Table 1.2

Profile of Mathematics Teachers in Terms of Age

Levels	Counts	Total Percentage	Cumulative Percentage
25 years old and below	*1*	*2.5%*	*2.5 %*
26-30 years old	*8*	*20.0%*	*22.5 %*
31-35 years old	*8*	*20.0%*	*42.5 %*
36-40 years old	*8*	*20.0%*	*62.5 %*
41-45 years old	*7*	*17.5 %*	*80.0 %*
46-50 years old	*5*	*12.5 %*	*92.5 %*
51-55 years old	*3*	*7.5 %*	*100.0 %*

The data presented in Table 1.2 shows the age distribution of Mathematics teachers who participated in the study. The highest percentage of teachers falls within the age range of *26-40* years old, accounting for *20%*

of the total respondents. This indicates that the majority of the teachers in the study are relatively young, with many still early in their teaching careers.

The next largest age range is *41-45* years old, with seven (*7*) respondents representing *17.5%* of the total participants. This suggests that there is still a significant number of experienced teachers in the study, although they make up a smaller proportion of the total than the younger teachers. The age range of *46-50* years old is the next smallest group, representing only *12.5%* of participants. The smallest age range is *51-55* years old, with only three (*3*) participants representing *7.5%* of the total.

Overall, the majority of Mathematics teachers in the study are relatively young, with many in their 20s and 30s. This may have implications for understanding the teaching practices and perspectives of this age group, as well as the potential need for professional development programs targeted at this demographic.

The findings implies that there may be differences in the effectiveness of teachers depending on their ages as well as the degrees of experience they have had. This suggests that teachers who are younger and have less experience may need additional support and training to improve their teaching skills, whereas teachers who are older and have more experience may have a greater level of proficiency in delivering instruction because of their greater level of expertise.

Investigating these differences could help identify areas where teacher training and professional development programs can be improved to better support teachers at all stages of their careers.

The statement highlights the importance of understanding the role that age and experience play in teacher effectiveness and the need for ongoing support and professional development to ensure that all teachers are equipped with the skills and knowledge needed to deliver high-quality instruction based on Michael (2015), as cited by Ismail, Mahmood, and Abdelmaboud (2018).

It is interesting to note that teaching experience was found to have a different effect on self-efficacy than gender. The study found that teaching experience was more hands-on and practical compared to technology integration, which required a more theoretical understanding of the subject matter. The huge statistical disparities between the two when assessing an individual's self-efficacy in regard to technology integration suggests that experience in teaching does not necessarily translate to a higher degree of self-efficacy in technology integration. This highlights the need for studies that focus specifically on the impact of gender and years of teaching experience on self-efficacy related to technology integration (Lessani et al., 2020).

The Level of Technological Capability of Mathematics Teachers

Table 2 presents the responses of the teachers based on their technological capability.

Table 2

Level of Technological Capability of Mathematics Teachers

Items *As a teacher, I am capable of …*	Mean	Description
1.discussing the basic parts of the computer.	*4.20*	Highly Capable
2.performing the basic operating procedure of the computer.	*4.33*	Highly Capable
3.attaching and configuring printer, scanner, camera, speaker, and HDMI processed-peripherals.	*4.22*	Highly Capable
4.making clear presentation (Microsoft Powerpoint) such as creating and editing slides, inserting images, tables, charts, and sounds, changing font, design, effects, colors and layout, and adding animation and transitions.	*4.33*	Highly Capable
5.using word processor (Microsoft Word) such as creating a new document, opening an existing document, insert images, tables, page number, headers and footers, and bullets, and change font styles, size and color, page set up, borders, indention and spacing.	*4.47*	Highly Capable
6.utilizing spreadsheets (Microsoft Excel) such as creating and enter data on a new spreadsheet, format and sort cells, insert and delete rows, columns, formula, and creating and modify charts (graphs).	*4.42*	Highly Capable
7.accessing the World Wide Web (internet) such as navigating the known websites, do basic searches, alter browser preferences, and save and download images and documents.	*4.35*	Highly Capable
8.managing Email such as creating, open, and accessing email account, adding attachments to email and send, locate spam, sent, drafts, and deleted messages, accessing and using the platforms in the email (classroom, drives/clouds, video conferencing), and accessing and using adding press book entries.	*4.17*	Highly Capable
9.understanding and perform the basic operation such as turning on and off with or without using remote control, adjusting screen resolution, and make a connectivity to antenna and/or cable system.	*4.22*	Highly Capable
10. using the remote control such as mute and unmute function, connectivity from a wireless device to TV through cast view, and search program setting.	*4.30*	Highly Capable
11. identifying the correct source of media/program such as cable system, Cast View, VGA (Video Graphics Adapter), HDMI (High-Definition Media Interface), and USB (Universal Serial Bus).	*4.22*	Highly Capable
12. connecting the unit to other media such as Speaker, and Desktop/Laptop Computer.	*4.38*	Highly Capable
13. identifying and defining the parts and its complements such projector, screen, VGA (Video Graphics Adapter), HDMI (High-Definition Media Interface), and electronic media devices (computer, tv).	*4.13*	Highly Capable
14. making adjustments on the resolution manually, using of remote control, zooming in/out function, and lateral and horizontal.	*4.17*	Highly Capable
15. utilizing the technological devices during Classroom Instruction, NAT review, Film Viewing, and training and seminar.	*4.20*	Highly Capable
Over-all Mean	***4.28***	**Highly Capable**

The items with the highest mean are using word processor (Microsoft Word) with a mean of *4.47* and utilizing spreadsheets (Microsoft Excel) with a mean of *4.42*. This indicates that the teachers who participated in the survey were highly capable of using these software applications in creating documents, managing data, and making presentations.

On the other hand, the item with the lowest mean is identifying and defining the parts and complements of technological devices such as projectors, screens, VGA, HDMI, and electronic media devices, with a mean of *4.13*. This suggests that the teachers have a lower level of capability in identifying and defining these technological components.

Overall, the mean score of the teachers is 4.28, indicating that they are highly capable of performing various computer-related tasks. This suggests that the teachers have a good level of proficiency in using various technological devices and software applications in performing classroom instructions, facilitating NAT review, film viewing, training, and seminars.

This implies that it would be to the advantage of Mathematics teachers if they could successfully incorporate technology into their classes and classrooms. This would put them in a position to teach at a more advanced level. One component of this expertise is the ability to teach and learn with an understanding of how to incorporate technology into both processes. In addition, the capacity in technological integration of Mathematics teachers and TPACK is not affected in any way, shape (Lessani et al., 2020).

According to the findings, Mathematics teachers have a description of highly *capable* when it comes to using word processors (such as Microsoft Word), including the ability to generate a new document, open an existing document, insert images, tables, page numbers, headers and footers, and bullets, and change font styles, size and color, page setup, borders, indentation, and spacing with a mean score of *4.47*. With a mean score of *4.42*, Mathematics teachers are highly capable when it comes to using spreadsheets (Microsoft Excel), including the ability to create and enter data on a new spreadsheet, format and sort cells, insert and delete rows, columns, formulas, as well as create and modify charts (graphs). They have a mean score of *4.38*, which indicates that they are highly capable of connecting the unit to other forms of media such speaker or a desktop or laptop computer in their role as a Mathematics teacher.

With a mean score of *4.35*, Mathematics teachers are highly capable of accessing the World Wide Web (internet) and performing tasks such as navigating well-known websites, conducting basic searches, customizing browser preferences, and saving and downloading images and documents. Mathematics teachers are also highly capable of performing the fundamental operations of a computer, with a mean score of *4.33*. The respondents had a mean score of *4.30* when it comes to using the remote control, which includes functions such as the mute and unmute buttons, connecting a wireless device to the television utilizing cast view, and searching for a show to set.

The respondents are highly capable of attaching and configuring printer, scanner, camera, speaker, and HDMI processed-peripherals and identifying the correct source of media/program such as cable system, Cast View, VGA (Video Graphics Adapter), HDMI (High-Definition Media Interface), and USB (Universal Serial Bus) with a mean of *4.22.* Marked a mean of *4.20,* Mathematics teachers are highly capable of discussing the parts of the computer and utilizing the technological devices during classroom instruction, facilitating NAT review, film viewing, and training and seminar.

In managing e-mail, which includes things like creating, opening, and accessing an email account, adding attachments to an email and sending it, locating spam, sent, draft, and deleted messages, accessing and using the platforms in the email (classroom, drives/clouds, video conferencing), accessing and using adding press book entries, as well as manually adjusting the resolution of an image, using of remote control, zooming in/out function, and lateral and horizontal, Mathematics teachers have a description of highly capable with a mean of *4.17*. With a computed a mean of *4.13*, Mathematics teachers are highly capable of identifying and defining the parts and its complements such projector, screen, VGA (Video Graphics Adapter), HDMI (High-Definition Media Interface), and electronic media devices (computer, television).

This suggests that when information and communications technology (ICT) is utilized in the classroom, students will have the opportunity to take part in interactive activities that require them to draw on a wider variety of information and expertise as they pursue their academic endeavors. This is because students will have access to a wider variety of information and expertise through the use of ICT.

At the same time, the perspectives and attitudes of the teachers will play a part in determining whether or not they choose to incorporate ICT into their methods of instruction. This decision will be made simultaneously with the decision to incorporate ICT into their methods of instruction. Teaching and learning with information and communications technology (ICT), particularly accessibility to the internet, will make the teaching and learning of knowledge borderless and establish a virtual learning environment for both students and teachers (Ghavifekr & Rosdy, 2015).

Significant Difference in the Level of Technological Capability of Mathematics Teachers

Tables 3.1 and 3.2 contain useful information about the technological capability of Mathematics teachers, which has been categorized by age and gender. These tables provide a thorough examination of how proficient the teachers are in employing technology to improve their methods of instruction. The information provided in these tables is essential for gaining insight into teacher technical capabilities and how they may affect the quality of education provided to students.

Table 3.1

Significant Difference in the Level of Technological Capability of Mathematics Teachers when Grouped According to Sex

Groups	Mean Rating	t-value	p-value	Remarks
Female	*4.21*	*-0.504*	*0.617*	**No Significant Difference**
Male	*4.33*			

Table 3.1 suggests that there is no significant difference in the level of technological capability of Mathematics teachers based on their sex. This conclusion is drawn from the fact that the p-value (*0.617*) is greater than the alpha level (*0.05*), which indicates that there is no significant difference in the technological capability of male and female Mathematics teachers.

This finding implies that the teaching process of Mathematics teachers is not significantly affected by their sex, meaning that both male and female Mathematics teachers are equally capable of integrating technology into their teaching practices. This is a positive outcome since it highlights that gender does not play a significant role in the use of technology in the classroom.

As discussed by Lomibao (2016), the responsibility of the teacher to plan and prepare a lesson is typically alone. Each teacher is in charge of selecting the materials to be utilized, the delivery method for the lesson, and the evaluation method for the students. This suggests that the effectiveness and efficiency of the educational process depends on the teaching skills, proficiency, and materials used such as ICT-based instructions and traditional methods.

Table 3.2

Significant Difference in the Level of Technological Capability of Mathematics Teachers when Grouped According to Age

Groups	Mean Square	F	p	Remarks
Age	*1.235*	*3.12*	*0.016*	**There is a Significant Difference**
Residuals	*0.396*			

Based on the presented data on Table 3.2, with an estimated marginal means, it shows that there is a significant difference in the level of technological capability of Mathematics teachers when grouped according to age since the *p-value = 0.016* is lesser than the α = 0.05. More specifically, using Tukey test for Post Hoc Analysis, it was found that the level of technological capability of Mathematics teachers aged of 26-30 years old differ significantly from those teachers aged 51-55 years old since the *p-value (Tukey) = 0.043* is lesser than $\alpha = 0.05$. It was also found that the level of technological capability of Mathematics teachers aged of 36-40 years old differ significantly from those teachers aged 51-55 years old since the *p-value (Tukey) =0.011* and is lesser than $\alpha=0.05$

The study conducted by Tweed (2013) aimed to investigate whether factors such as age, gender, years of teaching experience, and technology professional development had any impact on the level of self-efficacy and technology use among teachers. The results showed that these factors did not have a significant effect on the level of teaching proficiency that teachers have when it comes to using technology in the classroom. This means that regardless of age, gender, years of experience, or the number of hours spent on technology professional development, teachers still have a similar level of confidence in their ability to use technology.

Moreover, the findings also suggested that these factors did not significantly affect the use of technology in the classroom by teachers. This means that regardless of age, gender, years of experience, or the number of hours spent on technology-related professional development, teachers still use technology at a similar rate. Therefore, it is not the personal attributes of the teachers but rather the context in which they teach and the available resources that influence the use of technology in the classroom. They suggest that focusing on professional development alone may not be sufficient and that other contextual factors need to be considered to improve the use of technology in the classroom. However, the research showed that there is a substantial positive relationship between the usage of classroom technology by instructors and the level of self-efficacy that teachers have.

The table illustrates the amount of technological capability possessed by Mathematics teachers, regardless of their age gap. This capability is determined, in large part, by the role that teachers play in the incorporation of

ICT. The possibility exists that the programs' primary focus is on the provision of ICT resources and the upskilling of teachers, but that they disregard the personal attitudes and beliefs that teachers have towards technology as a factor for the success of educational ICT integration. The integration of technology in classrooms is influenced by several factors, such as personal attitudes towards technology, preconceived beliefs about its effectiveness in teaching, preconceived beliefs about one's own ability to use technology, pedagogical beliefs, and perceptions of whether experienced teachers are willing to incorporate ICT into their teaching methodologies.

This suggests that the extent to which inexperienced teachers are familiar with the fundamentals and practices of educational technology is not a significant factor in determining whether or not they have the mindset necessary to make the most of information and communication technologies (ICT) when instructing students who are living in the 21st century. This implies that the extent to which inexperienced teachers are familiar with the fundamentals and practices of educational technology is not a significant factor (Balajadia, 2017).

Despite the belief among newly hired basic education teachers that they possess the necessary skills to handle the administrative tasks associated with information and communication technology (ICT) in their daily work, there are concerns regarding their ability to effectively utilize ICT for promoting 21st-century skills in their students. This uncertainty stems from their lack of familiarity with online activities, which raises doubts about their capacity to leverage ICT as a tool for cultivating essential skills relevant to the demands of the 21st century. In light of this, educational technology and strategy courses in teacher education should include application activities in networking, online interaction, and relate to the ability and module production. These activities would be in addition to the standard internet research and word processing. On the other hand, traditional ways of teaching should not be completely disregarded in favor of establishing innovative new approaches that, when combined with modern ways of teaching, make the traditional methods both more interesting and thought-provoking (Balajadia, 2017).

The Level of Teaching Proficiency in Using ICT-Based Instruction of the Mathematics Teachers

Table 4 provides an overview of the level of teaching proficiency in using ICT-based instruction of Mathematics teachers in central secondary schools in Malapatan municipality. The presented table displays the mean scores of two specific indicators, namely CO1 Indicator 3 and CO2 Indicator 3, along with the overall mean score. Its purpose is to provide a comprehensive understanding of the statistical data regarding the given indicators. The primary objective of the table is to present a comprehensive overview of the level of teaching proficiency demonstrated by Mathematics teachers in their utilization of technology to enhance instructional delivery.

Table 4

Level of Teaching Proficiency in Using ICT-Based Instruction of the Mathematics Teachers

Items	Mean	Description
1. CO1 Indicator 3 Result	*5.95*	Consolidating
2. CO2 Indicator 3 Result	*6.30*	Consolidating
Over-all Mean	***6.13***	**Consolidating**

The results of the proficiency of teachers in teaching Mathematics using the standardized tools developed by the Department of Education's Central Office, the Classroom Observation Tools, are presented in Table 4. As shown in the table, CO2 levels are higher, with an average of *6.30* interpreted as consolidating. The teachers received an average score of *5.95* interpreted as consolidating on the first observation. This simply means that the teachers are using ICT-inclined teaching instruction as part of their improvement in CO2 tools objectives. Thus, the is *6.13* which is interpreted as consolidating.

This indicates that the Mathematics teachers displays a Consolidating rating based on DepEd Order (DO) No. 2, S. 2015 or the Guidelines on the Establishment and Implementation of the Results-Based Performance Management System (RPMS) in the Department of Education. The teacher should possess an accurate and profound understanding of all concepts and demonstrate this knowledge in a way that is responsive to the developmental needs of the learners and encourages learning. The teacher should also be able to establish meaningful connections between different areas of the curriculum when necessary. Additionally, the teacher should incorporate information and communications technology (ICT) into their teaching and demonstrate how it can be used productively to enhance the teaching and learning process.

According to the findings, this indicates that there is not a statistically significant difference between males and females, nor is there an age gap in relation to the Mathematics teachers' ability to teach the subject. On the other hand, there is a potential that sex plays a more significant role in the level of self-efficacy associated with technological integration (Lessani et al., 2020).

In contrast to teaching experience, it is statistically distinct when referring to an individual's personal sense of self-efficacy about the incorporation of technology. This is one of the reasons why it is so important to have both traditional and ICT-based instruction (Hsu, Tsai, Chang, & Liang, 2017).

There was not a discernible link between the number of years spent teaching and levels of technological self-efficacy, as stated by the findings of the research carried out by Buabeng-Andoh (2012), which was cited by Lessani et al (2020). In addition to this, the findings of this research indicate that teachers of Mathematics have a high level of self-efficacy about the integration of technology with TPACK and all of its sub-constructs.

Furthermore, Bognoson (2022) explored the proficiency of Mathematics teachers not only in their teaching abilities but also in their technological competence. The incorporation of ICT-based instruction in Mathematics education offers a range of benefits, including facilitating collaborative learning, fostering higher-order thinking skills, and nurturing students' digital literacy, which is essential in the contemporary digital era. This entails recognizing the potential impact of specific subject areas, determining the opportune moments to support or hinder ongoing learning, and adapting to the constant evolution of the technological landscape. By considering these factors, educators can effectively harness the power of technology to enhance Mathematics instruction and prepare students for success in the digital world.

Significant Difference in the Level of Teaching Proficiency in Using ICT-Based Instruction Among Mathematics Teachers

Tables 5.1 and 5.2 provide an in-depth look at the technological competence of math educators in implementing ICT-based instruction, categorized by sex and age. The data reveals variations in teaching practices between male and female teachers and different age groups, bringing clarity on the impact of these factors on the effectiveness of ICT-based teaching. The findings of this study hold valuable insights that can be utilized to develop targeted interventions aimed at enhancing math teaching practices. Specifically, these interventions can focus on improving technological capability across diverse demographic groups. By incorporating the identified findings into educational strategies and curriculum development, teachers can effectively address the specific needs and challenges faced by different groups of learners in relation to Mathematics and technology.

Table 5.1

Significant Difference in Level of Teaching Proficiency in using ICT-Based Instruction Among Mathematics Teachers when Grouped According to Sex

Groups	**Mean**	**Statistics**	**p-value**	**Remarks**
Female	*6.00*	*-0.879*	*0.385*	**No Significant Difference**
Male	*6.24*			

Since the p-value of *0.385* is higher than *0.05*, there is not a significant difference in the level of teaching proficiency in using ICT-based instruction among Mathematics teachers when grouped according to sex. This is because the p-value is greater than the threshold for significance, which is *0.05*.

According to Basargekar and Singhavi (2017), perspective of teachers on ICT-based instructions can be influenced by a number of factors, including their sex. The discussion on ‘sex’ as a factor impacting instructors is significant since it might have a long-term impact on the deployment of ICT in the classrooms. This makes the topic of ‘sex’ a vital one to discuss. Additionally, it may shed some light on the implications of policy both at the level of the school and at the level of the government.

Based on the findings, it appears that male Mathematics teachers have a better degree of proficiency than their female counterparts when it comes to utilizing information and communication technology in the classroom. This is the case when compared to other countries. It is possible that the problem is caused by both of these factors. To begin, the percentage of male teachers is disproportionately high at the school level because, in the context of the municipality as a whole, the teaching profession is regarded as an appropriate (i.e., safe, respectable, etc.) career choice for educated male. Because of this, there is a far higher proportion of male teachers working in schools than there should be.

Table 5.2

Significant Difference in Level of Teaching Proficiency in using ICT-Based Instruction Among Mathematics Teachers when Grouped According to Age

Groups	Mean Square	F	p	Remarks
Age	*0.338*	*0.424*	*0.858*	**No Significant Difference**
Residuals	*0.798*			

Table 5.2 shows that there is no significant difference in the level of teaching proficiency in using ICT-based instruction among Mathematics teachers when grouped according to age since the *p-value=0.858* which is greater than the *α=0.05*. Based on the findings, it appears that a teacher's sexual orientation does not impact their ability to effectively instruct students using ICT-based instruction in the teaching-learning process. ICT can assist alter a teaching environment into a setting that is more learner-centered.

According to Kurnik (2008), which was cited by Buison (2014), in order for a teacher to understand the science principle behind the various mathematical concepts they are teaching, it is necessary for the teacher to properly implement the process of expressing concepts (observation, concept idea, concept formulation) and to adhere to the rules that must be satisfied in order to meet the requirements of the concept definition (appropriateness, content minimum, conciseness, naturalists, applicability, and contemporariness).

Significant Relationship Between the Level of Technological Capability and the Level of Teaching Proficiency in using ICT-Based Instruction Among Mathematics Teachers

Results on the significant difference between the level of technological capability and the level of teaching proficiency in using ICT-based instruction among Mathematics teachers are presented in Table 6.

Table 6

Significant Relationship Between the Level of Technological Capability and the Level of Teaching Proficiency in using ICT-Based Instruction Among Mathematics Teachers

Level of Technological Capability of Mathematics Teachers			
Level of Teaching Proficiency	**Pearson's R**	**p-value**	**Remarks**
	0.401	*0.010*	**With Significant Relationship**

It was found out through the use of Pearson's Product Moment Correlation that there is a significant relationship between the level of technological capability and the level of teaching proficiency in using ICT-based instruction among Mathematics teachers. This was discovered after looking at the correlation between the two variables because the *p-value of 0.010* is lower than the $\alpha=0.05$, and $r=0.401$ is interpreted as a weak positive linear relationship between the two variables. This is because the p-value is less than $\alpha=0.05$, and the p-value is less than $\alpha=0.05$.

The integration of information and communication technologies (ICT) in education has been widely recognized as an effective means of enhancing the quality and accessibility of teacher education. By utilizing various ICT technologies, such as multi-modal courseware, teaching and learning can be significantly improved. The incorporation of Information and Communications Technology (ICT) in education not only enhances student engagement but also facilitates a more interactive learning experience. By leveraging ICT tools, students have access to a diverse range of resources that support their learning process.

Furthermore, the integration of new pedagogical practices with ICT technologies has the potential to facilitate the development of higher-order thinking skills among learners. This includes critical thinking, problem-solving, and creativity, which are all essential skills that are necessary for success in the 21st century. By leveraging the benefits of ICT technologies in education, teachers and learners alike can greatly benefit from the numerous opportunities presented by these innovative tools.

ICT-Based Instruction Perspective of Mathematics Teachers

The findings presented in Table 7 provides a thematic analysis of the ICT-based instruction perspective of the participating teachers. This qualitative data provided valuable insights into the challenges faced by Mathematics teachers in integrating ICT in their teaching practices. By identifying the barriers, strategies can be developed to overcome them and improve the use of ICT in teaching and learning.

Table 7

ICT-Based Instruction Perspective of Mathematics Teachers

Major Themes	Core Ideas	Frequency of Responses
ICT-Based Instruction Increases Students' Interest	The integration of ICT-based learning enables the teacher to present virtual modelling of mathematical ideas.	**General**
	The integration of ICT-based learning promotes conceptual understanding of the topic through the help of ICT integration.	**General**
ICT-Based Instruction Accommodates Multiple Learning Styles	The integration of ICT-based learning encouraged the engagement of the student in teaching-learning process and lessen the teacher's discussions.	**General**
	ICT integration in Mathematics education helps teachers engage students and deepen their comprehension of mathematical concepts.	**General**
ICT-Based Instruction Simplifies Workload	The integration of ICT-based allows teachers to capitalize on the assumption that it can assist students visualize mathematical ideas and concepts.	**General**
	Mathematics teachers reduced complexity of the subject matter as a result of their efforts to use ICT-based instruction.	**General**

ICT-Based Instruction Increases Students' Interest. Informant 1, a male, is 34 years old, and Respondent 3, a female, is 28 years old. They both gave the same response to the first question, which had the same idea and context. Both of the responders in both of the responses stated that:

> "Because of the technology, I am able to present lessons that can help the students become more interested in the material and maintain their focus while they are learning it."

Informant 4, a woman who is 37 years old, offered an answer to the following question by expressing that the use of technology makes it much easier for students to obtain knowledge and discover facts. Making it less difficult for the instructor to share more information with the students who are now being instructed Informant 1 adds that technology offers access to a greater variety of information sources, such as the internet, which can be used for research purposes.

The Integration of ICT-Based Learning Enables the Teacher to Present Virtual Modelling of Mathematical Ideas. Teachers can use 3D modelling software to create virtual representations of geometric shapes or use graphing software to plot mathematical functions. By presenting these virtual models to students, teachers can make abstract mathematical concepts more concrete and visually understandable. This can be particularly beneficial for students who struggle with visualizing abstract concepts and may improve their overall understanding of Mathematics.

Moreover, virtual modelling through ICT-based learning can help to create a more engaging and interactive learning experience for students. Students can explore and manipulate these models in real-time, allowing them to gain a deeper understanding of mathematical concepts through hands-on experience.

Overall, the integration of ICT-based learning in Mathematics teaching provides teachers with a powerful tool to present virtual modelling of mathematical ideas that can enhance the learning experience for students and facilitate deeper understanding of mathematical concepts.

The Integration Of ICT-Based Learning Promotes Conceptual Understanding of the Topic Through the Help of ICT Integration. The integration of ICT in teaching Mathematics can promote conceptual understanding of the topic by providing various digital resources that allow students to explore mathematical concepts in more depth. ICT integration provides tools such as virtual manipulatives, simulations, and animations that can help to illustrate abstract concepts in a more tangible and engaging way, making them more understandable for students.

Students can use graphing software to plot functions and visualize the relationship between variables. This can help students develop a deeper understanding of concepts such as rates of change and transformations of functions. Additionally, the use of interactive simulations can help students explore mathematical concepts in a more visual and interactive way, helping them to better grasp the underlying concepts.

The fact that teachers do not have adequate access to technology contributes to their perception that they are not adequately prepared to integrate ICTs into their lessons (Tondeur, Braak, Sang, Voogt, Fisser, & Ottenbreit-Leftwich, 2012). The affordances and constraints of information and communication technologies (ICTs) in the classroom are inherently connected to the technologies themselves. Although teachers may have access to technology, its impact is hindered by two main factors: insufficient and unreliable technology resources and inconsistent implementation within the school environment. The limited availability of technological tools and their unreliable performance restrict teachers from fully leveraging their potential for enhancing teaching and learning. Inconsistent technology integration in schools hinders teachers' proficiency in using and seamlessly incorporating these tools into their instructional practices.

Teachers make sense of the opportunities and demands of their specific contexts has an effect on the ways in which they draw upon and integrate the knowledge sources at their disposal (Ling Koh, Chai, & Tay, 2014). Therefore, if teachers believe that contextual factors prevent them from making effective use of information and communication technologies (ICTs), this may further entrench their unwillingness to modify their pedagogical approaches to make them more inclusive of ICTs.

ICT-Based Instructions Accommodates Multiple Learning Styles. Informant 5, a male, is 49 years old, gave response to the second question, which had the same idea and context, and stated that:

> "Yes. By using ICT, multiple learning styles can be accommodated. I could also able to plan, organize, and deliver my lessons well. Using ICT as a tool, I could be able to make research for my content and sequence my lessons using powerpoint presentations. I could also use ICT as tool to perform calculations, draw graphs and help solve complex problems."

The integration of ICT-based learning encouraged the engagement of the student in teaching-learning process and lessen the teacher's discussions. Engaging students in the teaching-learning process and reducing the discussing or talking of teacher promoted student-teacher collaboration. This encouraged the learners improve their comprehension and memory.

Teachers made studying more interactive by involving students. Students were urged to ask questions, share ideas, and work together instead of just listening to teachers. Students were challenged to think autonomously and create their own ideas, which improved critical thinking, problem-solving, and creativity. Less teacher talks also helped students take charge of their learning. Students were encouraged to self-direct and take accountability for their learning. Teachers made education more student-centered by letting students participate in their learning. Teachers created a more interactive and dynamic learning atmosphere that fostered deeper understanding, critical thinking, and creativity by engaging students in the teaching-learning process and reducing their discussions. This method inspired students to take charge of their education (Gray & DiLoreto, 2016).

ICT Integration in Mathematics Education Helps Teachers Engage Students and Deepen Their Comprehension of Mathematical Concepts. The integration of ICT in Mathematics education helped teachers engage students and deepen their comprehension of mathematical concepts. By using digital resources such as virtual manipulatives, simulations, and animations, teachers were able to present mathematical concepts in a more engaging and interactive way. This allowed students to explore mathematical ideas more deeply, which improved their understanding and retention of the subject matter. Additionally, the use of ICT in Mathematics education facilitated the development of higher-order thinking skills such as problem-solving, critical thinking, and creativity.

A learning style, according to Dunn and Bruke (2006), as cited by Bosman and Schulze (2018), is defined by how a learner begins to focus on, manage, internalize, and recall new content. The interaction of these elements differs from person to person and can be influenced by gender, age, and culture (Boström, 2012).

ICT-Based Instruction Simplifies Workload. Informant 5, a male who is 34 years old, mentioned that the utilization of ICT in the classroom frees up additional time for the teacher to prepare and reflect on the material that they will present to the class. Informant 5 expressed the view that this presents an opportunity for growth for Mathematics educators. It is easier for a teacher to put together presentations after receiving training in information and communication technology, which reduces the amount of work that must be done to prepare for them.

> "It can be used as a tool wherein the teacher can easily scroll back or look back the previous lessons and discussions for clarification or for further and deeper explanation."

***The Integration of ICT-Based Allows Teachers to Capitalize on the Assumption that it can Assist Students Visualize Mathematical Ideas and Concepts*.** The integration of ICT in Mathematics education allowed teachers to take advantage of the assumption that it could help students visualize mathematical ideas and concepts. With the use of digital resources such as interactive whiteboards, educational software, and online tools, teachers were able to present mathematical concepts in a more visual and interactive way. This approach made it easier for students to comprehend and remember the subject matter by making it more accessible and engaging. Through ICT-based instruction, teachers created a more dynamic and collaborative learning environment, which encouraged active participation and critical thinking among students. Mathematics education benefited greatly from the use of ICT-based learning, as it not only enabled the visualization of mathematical concepts but also facilitated the development of higher-order thinking skills among students, such as problem-solving and creativity. Through the visual features of ICT tools, teachers were able to create dynamic and interactive learning environments that encouraged a deeper comprehension of Mathematics.Consequently, the integration of ICT in the past proved to be a valuable pedagogical approach for Mathematics teachers, empowering them to effectively support their students in visualizing and comprehending complex mathematical concepts (Bognoson, 2022).

Mathematics Teachers Reduced Complexity of the Subject Matter as a Result of Their Efforts to Use ICT-Based Instruction. Through the responses of the informants, it was decoded that Mathematics teachers were able to reduce complexity of the subject matter through their efforts to use ICT-based instruction.

The use of ICT-based instruction reduced preparation time for Mathematics teachers, enabling them to provide individualized attention to students. This highlights the positive impact of technology on teachers' workload and their ability to be more efficient and effective in teaching.

The interviews with five teachers confirm that technology integration enhances academic performance. This aligns with the widely-held belief that incorporating ICT in the classroom improves students' knowledge and skills, especially in Mathematics. Abel, Tondeur, and Sang (2022) conducted a study that provides compelling evidence of the effectiveness of technology integration in enhancing subject-specific competencies. Their findings underscore the importance of using ICT tools to promote better learning outcomes for students.

Chapter V

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary, findings, conclusions, and recommendations of the study.

Findings

Based on the result of the study, the following are the summary of the findings:

1. The Profile of Mathematics Teachers

1.1. The distribution of Mathematics teachers in terms of sex reveals that out of the total population of *40* teachers, *19* of them are female, accounting for 47.5% of the population, while *21* are male, representing 52.5% of the total population.

1.2. In terms of age, there are eight (*8*) Mathematics teachers who are in the age range of 26 years old to 30 years old which has a percentage of *20%*. There are eight (*8*) Mathematics teachers who are in the age range of 31 years old to 35 years old which has a percentage of *20%*, there are eight (*8*) Mathematics teachers who are in the age range of 36 years old to 40 years old which has a percentage of *20%*. There are seven (*7*) Mathematics teachers in the age range of 41 years old to 45 years old, with a percentage of *17.5%,* five (*5*) Mathematics teachers in the age range of 46 years old to 50 years old, with a percentage of *12.5%,* three (3) Mathematics teachers in the age range of 51 years old to 55 years old, with a percentage of *7.5%,* and one (1) Mathematics teacher in the age range of 25 years old and below.

2. The Level of Technological Capability of Mathematics Teachers

The level of the technological capability of Mathematics teachers in the context of performing various computer-related tasks was evaluated using the mean and the weighted mean. It has been determined that the Mathematics teachers have a technological capability level of *4.28*, which can be viewed as highly capable.

2.1. The level of technological capability of Mathematics teachers was analyzed by grouping them according to sex. T-tests for independent samples were conducted, and the results indicated that there is no significant difference in the level of technological capability between male and female Mathematics teachers. The obtained p-value of *0.617* is greater than the predetermined significance level of $\alpha = 0.05$, suggesting that the difference in technological capability based on sex is not statistically significant.

2.2. An analysis of variance (ANOVA) was conducted to examine the relationship between the level of technological capability of Mathematics teachers and their age, as well as their level of teaching proficiency in using ICT-based instruction. The results of the ANOVA revealed insights into how the technological capability of Mathematics teachers varied across different age groups and its association with their teaching proficiency in ICT-based instruction. There is a significant difference in the level of technological capability of Mathematics teachers when grouped according to age since the *p-value* = *0.016* is lesser than the $\alpha=0.05$. More specifically, using Tukey test for Post Hoc Analysis, it was found that the level of technological capability of Mathematics teachers aged of 26-30 years old differ significantly from those teachers aged 51-55 years old since the *p-value (Tukey)* = *0.043* is lesser than $\alpha=0.05$. It was also found that the level of technological capability of Mathematics teachers aged of 36-40 years old differ significantly from those teachers aged 51-55 years old since the *p-value (Tukey) = 0.011* which is lesser than $\alpha=0.05$.

3. Level of Teaching Proficiency in Using ICT-Based Instruction of the Mathematics Teachers

The results on the evaluation of the teachers' capability to teach High School Mathematics using ICT-based instruction were gathered by the researcher from KRA 1 (Content Knowledge and Pedagogy), specifically on objective 2, which states that “Ensured the positive use of ICT to facilitate the teaching and learning process,” and KRA 3 (Curriculum and Planning), specifically on objective 7, which states that “Selected, developed, organized, and used appropriate teaching and learning resources, including:” The results of the teachers’ ability to teach High School Mathematics These key results areas (KRAs) are only applicable and put into practice for jobs ranging from Teacher 1 to Teacher 3. The level of teaching ability of the Mathematics teachers in employing ICT-based education is *6.13*, which can be regarded as Consolidating.

3.1. The study examined the level of teaching proficiency in using ICT-based instruction among Mathematics teachers when grouped by age. To determine if there was a significant difference in the level of teaching proficiency between male and female Mathematics teachers, a T-test for independent samples was conducted. It was found that there is no significant difference in the level of teaching proficiency in using ICT-based instruction among Mathematics teachers when grouped according to sex since the $p\text{-value} = 0.385$ is greater than the $\alpha=0.05$.

ANOVA was used when the participants were divided into age groups. Since the *p-value* = *0.858*, which is greater than the *α=0.05*, there is no significant difference in the level of teaching proficiency in using ICT-based instruction among Mathematics teachers when grouped by age.

3.2. Using Pearson's Product Moment Correlation, it was discovered that there is a significant relationship between the level of technological capability and the level of teaching proficiency in using ICT-based instruction among Mathematics teachers because the *p-value* = *0.010* is less than the *α=0.05* with *r=0.401* interpreted as a weak positive linear relationship.

4. ICT-Based Instruction Perspective of Mathematics Teachers

The analysis of the data uncovered three significant themes related to the use of ICT-based instruction in Mathematics education. The first theme indicates that ICT-based instruction has a positive impact on students' interest in the subject. Teachers reported that integrating ICT tools allowed them to present virtual models of mathematical ideas, leading to increased student engagement and improved conceptual understanding.

The second theme highlights that ICT-based instruction caters to different learning styles. Teachers observed that incorporating ICT tools facilitated student engagement during the teaching-learning process and reduced the reliance on teacher-led discussions. This approach enabled students to actively participate and enhance their comprehension of mathematical concepts.

The third theme emphasizes that ICT-based instruction eases the workload of Mathematics teachers. By leveraging ICT tools, teachers could take advantage of the potential benefits of visualizing mathematical ideas and concepts through technology. Consequently, teachers reported a reduction in the complexity of the subject matter and a more streamlined instructional approach. In summary, the findings demonstrate that ICT-based instruction in Mathematics education enhances students' interest, accommodates diverse learning styles, and simplifies the workload of teachers. These insights highlight the value of integrating ICT tools in the classroom to create more engaging and effective learning experiences in Mathematics.

Conclusions

Based on the summary of findings, hereunder are the conclusions:

1. The majority of Mathematics teachers are male, while the remaining are female. There is a higher representation of teachers in the age ranges of 26-30, 31-35, and 36-40 years old. The mean and weighted mean scores indicate that Mathematics teachers are highly capable in terms of their technological proficiency.

2. The level of teaching proficiency among Mathematics teachers when employing ICT-based instruction is considered Consolidating, as determined by the Classroom Observation Tools developed by the Department of Education's Central Office.
3. The T-test results reveal that there is no significant difference in the technological proficiency of Mathematics teachers when categorized by gender. However, when grouped by age, a significant difference in technological proficiency is observed. Specifically, Mathematics teachers aged 26-30 exhibit significantly different technological proficiency compared to teachers aged 51-55, likely due to differences in preferences and orientations towards ICT-based instruction.
4. The analysis indicates that there is no significant difference in the level of teaching proficiency in using ICT-based instruction among Mathematics teachers when grouped by gender or age. Both male and female Mathematics teachers, as well as teachers across different age groups, exhibit similar levels of capability in utilizing ICT-based instruction.
5. The level of teaching proficiency in using ICT-based instruction among male and female Mathematics teachers revealed that there is no significant difference in the level of teaching proficiency in using ICT-based instruction among Mathematics teachers when

grouped according to sex. When Mathematics teachers are compared by age, there is no significant difference in their level of capability to use ICT-based instruction.

6. A conclusion is drawn using Pearson's Product Moment Correlation, it was found that there is a significant relationship between technological capability and teaching proficiency in using ICT-based instruction among Mathematics teachers interpreted as a weak positive linear relationship.

7. Qualitative findings from interviews with Mathematics teachers highlight commonalities among the respondents. Teaching with ICT is reported to increase student interest by enabling the presentation of virtual modeling and conceptual ideas in Mathematics. Additionally, integrating ICT in instruction is seen as accommodating diverse learning styles. Teachers also perceive that the use of ICT simplifies their workload, suggesting a more streamlined approach to teaching Mathematics.

Recommendations

Based on the findings and conclusions, the following recommendation was made.

1. Conduct additional research to delve deeper into the age-based differences in technological proficiency among Mathematics

teachers. Explore the underlying factors contributing to the significant difference between teachers aged 26-30 and 51-55. This will provide insights into specific areas where additional training and support can be targeted to enhance technological capabilities among different age groups.

2. Implement professional development programs focused on enhancing teaching proficiency in using ICT-based instruction. These programs should be designed to cater to the needs of Mathematics teachers across all age groups and genders. Emphasize the effective integration of ICT tools to promote student interest, cater to diverse learning styles, and simplify the workload of Mathematics teachers.
3. Continuously assess and evaluate the technological proficiency of Mathematics teachers to monitor progress and identify areas for improvement. Implement regular assessments and feedback mechanisms to ensure ongoing development and support in utilizing technology effectively in the classroom.
4. Foster collaborative learning communities among Mathematics teachers to facilitate the sharing of best practices and experiences related to ICT-based instruction. Encourage peer mentoring and collaboration to create a supportive environment for professional growth and knowledge sharing.

5. Conduct longitudinal studies to track the long-term impact of technological capability and teaching proficiency on student outcomes in Mathematics education. Examine the correlation between teacher proficiency in utilizing ICT-based instruction and student engagement, performance, and conceptual understanding over an extended period.
6. Allocate resources and support to provide Mathematics teachers with access to updated and relevant ICT tools and resources. Ensure that schools are equipped with the necessary infrastructure and technology to support effective implementation of ICT-based instruction.
7. Inform division education policymakers about the findings of this study and advocate for policies that prioritize the integration of ICT tools in Mathematics education. Encourage the inclusion of training programs and support systems to enhance teachers' technological capabilities and teaching proficiency in using ICT-based instruction. These recommendations aim to enhance the technological capabilities and teaching proficiency of Mathematics teachers, leading to more effective and engaging instruction in Mathematics education through the integration of ICT tools.

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Appendix

QUESTIONNAIRE ON TECHNOLOGICAL CAPABILITY AND TEACHING PROFICIENCY OF MATHEMATICS TEACHERS IN USING INFORMATION AND COMMUNICATIONS TECHNOLOGY-BASED INSTRUCTION

PART I. PROFILE AND TEACHING PROFICIENCY OF MATHEMATICS TEACHERS

Name: ____

- Sex: ( ) Male ( ) Female
- Age:
  - ( ) 25 and below
  - ( ) 26 - 30
  - ( ) 31 - 35
  - ( ) 36 - 40
  - ( ) 41 - 45
  - ( ) 46 - 50
  - ( ) 51 – 55
  - ( ) Over 55

- Classroom Observation 1 rating on Indicator 3 (2020-2021)
  - ( ) 3 Organizing
  - ( ) 4 Developing
  - ( ) 5 Applying
  - ( ) 6 Consolidating
  - ( ) 7 Integrating

- Classroom Observation 2 rating on Indicator 3 (2020-2021)
  - ( ) 3 Organizing
  - ( ) 4 Developing
  - ( ) 5 Applying
  - ( ) 6 Consolidating
  - ( ) 7 Integrating

General Direction:

The items below will determine how capable the teachers are in performing the tasks relative to the using of electronic media. Check the appropriate box under each column that describes the respondent’s performance.

The follow-up qualitative questions below will determine the perspective of mathematics teachers towards ICT-based instructions. Write down your own answer on the space provided.

Legend:

Scale	Descriptive Interpretation
5	Very Highly Capable
4	Highly Capable
3	Moderately Capable
2	Less Capable
1	Incapable

PART II. TECHNOLOGICAL CAPABILITY OF MATHEMATICS TEACHERS

Items	Rating				
	5	4	3	2	1
1. As a teacher, I am capable of discussing the basic parts of the computer.					
2. As a teacher, I am capable of performing the basic operating procedure of the computer.					
3. As a teacher, I am capable of attaching and configuring printer, scanner, camera, speaker, and HDMI processed-peripherals.					
4. As a teacher, I am capable of making clear presentation (Microsoft PowerPoint) such as creating and editing slides, inserting images, tables, charts, and sounds, changing font, design, effects, colors and layout, and adding animation and transitions.					
5. As a teacher, I am capable of using word processor (Microsoft Word) such as creating a new document, opening an existing document, insert images, tables, page number, headers and footers, and bullets, and change font styles, size and color, page set up, borders, indention and spacing.					
6. As a teacher, I am capable of utilizing spreadsheets (Microsoft Excel) such as creating and enter data on a new spreadsheet, format and sort cells, insert and delete rows, columns, formula, and creating and modify charts (graphs).					
7. As a teacher, I am capable of accessing the World Wide Web (internet) such as navigating the known websites, do basic searches, alter browser					

preferences, and save and download images and documents.					
8. As a teacher, I am capable of managing Email such as creating, open, and accessing email account, adding attachments to email and send, locate spam, sent, drafts, and deleted messages, accessing and using the platforms in the email (classroom, drives/clouds, video conferencing), and accessing and using adding press book entries.					
9. As a teacher, I am capable of understanding and perform the basic operation such as turning on and off with or without using remote control, adjusting screen resolution, and make a connectivity to antenna and/or cable system.					
10. As a teacher, I am capable of using the remote control such as mute and unmute function, connectivity from a wireless device to TV through cast view, and search program setting.					
11. As a teacher, I am capable of identifying the correct source of media/program such as cable system, Cast View, VGA (Video Graphics Adapter), HDMI (High-Definition Media Interface), and USB (Universal Serial Bus).					
12. As a teacher, I am capable of connecting the unit to other media such as Speaker, and Desktop/Laptop Computer.					
13. As a teacher, I am capable of identifying and defining the parts and its complements such projector, screen, VGA (Video Graphics Adapter), HDMI (High Definition Media Interface), and electronic media devices (computer, tv).					
14. As a teacher, I am capable of making adjustments on the resolution manually, using of remote control, zooming in/out function, and lateral and horizontal.					
15. As a teacher, I am capable of utilizing the technological devices during Classroom Instruction, NAT review, Film Viewing, and training and seminar.					

(This questionnaire is adapted from Buison, T. (2014). *Electronic Media Availability and Level of Teachers' Technological Capability: Bases for Technological Capability Training and Technology Outsourcing Scheme.)*

PART III. ICT-BASED INSTRUCTION PERSPECTIVE OF MATHEMATICS TEACHERS

1. How has technology changed or affected the way mathematics teachers teach?

____
____
____
____

2. How could technology be used in the inquiry-based learning to improve the teaching and learning process in mathematics?

____
____
____
____

3. In your own perspective, does ICT-based instruction helps you improve your proficiency in teaching mathematics? How?

____
____
____
____

4. What are the challenges and hindrances you have encountered when using ICT-based instruction?

____
____
____
____

5. Is the integration of ICT-based instruction in teaching-learning process effective? Why or why not?

____
____
____
____

Appendix I

Classroom Observation Rating on Indicators 1 and 3

COT-RPMS

TEACHER I-III

RATING SHEET

OBSERVER: ______________________ DATE: ______________

TEACHER OBSERVED: ______________________ QUARTER: ______________

SUBJECT & GRADE LEVEL TAUGHT: ______________________

OBSERVATION 1☐ 2☐ 3☐ 4☐

DIRECTIONS FOR THE OBSERVER:

1. Rate each indicator on the checklist according to how well the teacher performed during the classroom observation. Mark the appropriate column with a (✓) mark.
2. Each indicator is assessed on an individual basis, regardless of its relationship to other indicators.
3. Attach your accomplished Observation Notes Form to the completed rating sheet.

THE TEACHER:	**3**	**4**	**5**	**6**	**7**	**NO***
1. Applies knowledge of content within and across curriculum teaching areas						
2. Uses a range of teaching strategies that enhance learner achievement in literacy and/or numeracy skills						
3. Applies a range of teaching strategies to develop critical and creative thinking, as well as other higher-order thinking skills						
4. Manages classroom structure to engage learners, individually or in groups, in meaningful exploration, discovery and hands-on activities within a range of physical learning environments						
5. Manages learner behavior constructively by applying positive and non-violent discipline to ensure learning-focused environments						
6. Uses differentiated, developmentally appropriate learning experiences to address learners' gender, needs, strengths, interests and experiences						
7. Plans, manages and implements developmentally sequenced teaching and learning processes to meet curriculum requirements and varied teaching contexts						
8. Selects, develops, organizes, and uses appropriate teaching and learning resources, including ICT, to address learning goals						
9. Designs, selects, organizes, and uses diagnostic, formative and summative assessment strategies consistent with curriculum requirements						

OTHER COMMENTS:

Note: For schools with only one observer, this form will serve as the final rating sheet.

Signature over Printed Name of the Teacher

Signature over Printed Name of the Observer

** **NO** stands for **Not Observed** which automatically gets a rating of 3.*