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ICT Utilization in Mathematics Teaching

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Abstract:

Inadequate infrastructure, inadequate teacher preparation, a lack of resources, and difficulties integrating ICT tools with curriculum and assessments are the main causes of the disparity in ICT use in math education. Many schools lack enough computers, dependable internet connectivity, and the right software to teach math. Financial constraints make it difficult to acquire the resources and equipment that are required. Access may be further restricted by crowded computer labs and frequent technical issues. This study aimed to determine the extent of ICT utilization in mathematics teaching in a district of a medium-sized schools division in central Philippines for the School Year 2024-2025 as basis for a capability building plan. The areas included in this study are teacher integration in mathematics instruction, teacher competency and readiness, student engagement and learning outcomes, pedagogical approaches with ICT. The extent of ICT utilization in mathematics teaching in the areas of ICT Integration in Mathematics Instruction, Teacher Competency and Readiness, Student Engagement and Learning Outcomes, and Pedagogical Approaches with ICT were recorded to be on great extent. The comparative analysis in the extent of ICT utilization in mathematics teaching in the areas of ICT Integration in Mathematics Instruction, Teacher Competency and Readiness, Student Engagement and Learning Outcomes, and Pedagogical Approaches with ICT when grouped and compared according to Age, Highest Educational Attainment, Length of Service, and Number of ICT Trainings showed no significant difference.

Keywords: Information and Communications Technology, ICT, Mathematics teaching, capability-building Plan

Introduction:

Nature of the Problem

The way mathematics is taught and studied has changed significantly as a result of the integration of information and communication technology into contemporary education. Research conducted in the Philippines examines the integration of ICT into math instruction, highlighting both the advantages and disadvantages for Filipino educators and learners (Enorme, 2024).

ICT use in math education is lacking due to a number of factors, including poor infrastructure, a lack of resources, inadequate teacher preparation, and difficulties integrating ICT tools with curricula and assessments. Reliable internet connectivity, enough computers, and the right software for teaching arithmetic are all lacking in many schools. The procurement of essential resources and equipment is impeded by financial constraints. Further restricting access can be overcrowded computer labs and frequent technical issues (Das, 2020).

Through its Computerization Program, the Department of Education aimed to provide public schools with technology advancements that would improve the effectiveness of instruction and learning and enable them to better address 21st-century challenges; nevertheless, the results were rarely satisfactory (Gamit, 2023).

Students' enthusiasm and interest in mathematics can be increased by using ICT technologies to make learning more dynamic and interesting. Lack of access to these tools can result in disengagement and decreased motivation, according to a study by Hussain (2019). Filipino students' limited use of ICT in math classes can hamper the development of critical skills and limit their prospects in the future by lowering interest, slowing learning, and perhaps lowering arithmetic achievement.

Current State of Knowledge

By fostering active learning, visualizing ideas, and creating dynamic settings, teachers can use ICT technologies to improve mathematics instruction and learning, which will ultimately increase student engagement and comprehension. This improves comprehension and visualization. ICT technologies, such as simulations or dynamic

geometry software, assist students in visualizing abstract mathematical ideas and connecting them. Students' motivation to learn mathematics can be increased by interactive learning games and activities (Das, 2020).

ICT is assisting educators and learners alike in better visualizing abstract concepts in a dynamic way. Nonetheless, if its application is "transparent" throughout the learning process, it can offer beneficial assistance. This is improved when educators are certain of their proficiency in both mathematics and ICT. Since technology by its very nature supports schools, it is crucial to learn how to incorporate it into math instruction. Large amounts of data can be stored and retrieved by computers, which also makes it possible for the data to be displayed more precisely and visually. Since technology can convey information in a variety of ways depending on the audience size and individual needs, using ICT into math lessons also makes it easier for all pupils to acquire mathematical concepts (Hilkemeijer, 2019).

Why math matters and why ICT should be used to teach it are still open questions. In Nigeria's primary and secondary school systems, mathematics is one of the most important core topics that is required. Because it is so important, many countries have made it mandatory. Eventually, it must become a part of our everyday lives. For the development and advancement of the entire country, it has become a vital instrument. An essential aspect of a person's existence is mathematics. We employ it in our daily tasks, either directly or indirectly. No matter how smart or uneducated a person is, they all need and use mathematics, thus living without it would have been quite difficult. Mathematics is all that has to do with counting and calculating (Onoshakpokaiye, 2022).

The use of ICT for education in traditional classroom settings by many American instructors may reveal their level of experience when they move to virtual environments during the coronavirus pandemic, according to the National Center for Education Statistics (2020). Compared to the ICILS average of 48%, half of eighth-grade teachers in the United States reported "using ICT at school when teaching" daily in 2018. The percentage of teachers in Finland (57 percent), Denmark (72 percent), and Moscow (76 percent) was higher than the U.S. percentage, though.

Onoshakpokaiye's (2022) study examined the use of ICT in mathematics education, advocating for appropriate integration and improving the performance of teachers and students in developing nations. Because of its advantages, the ICT is crucial to the study of mathematics. There are issues that math teachers have when incorporating these ICT technologies that need to be resolved. The study examined the literature on the following topics: the nature of mathematics, the vision of ICT, the nature of ICT, its incorporation into mathematics instruction, the challenges of using ICT in mathematics education, the willingness of educators to use ICT in mathematics education, ICT and its impact on mathematics education, the advantages of using ICT to learn and teach mathematics, and some ICT tools used in mathematics education.

Dogan (2021) conducted a study to investigate teachers' skills to integrate technology in education to help explain instructional and application software use. The data we used were from 1335 K-12 teachers involved in the Technology Uses and Perceptions Survey (TUPS) study. Teachers were located in 40 different institutions across the state of Florida. According to the findings of this study, the most significant factor in the instructional and application software use of teachers was found as perceived technology skills.

The 'ICT Integration in Elementary School for Mathematics Subject' study by Gamit (2023) evaluated the important connections among math teachers according to their profile attributes. A descriptive-correlational design was used by the investigator. The findings indicated that 1) teacher respondents from private schools scored higher on assessments of ICT implementation; 2) younger teacher respondents scored higher on assessments of ICT's impact on students' learning and more so than older ones, and 3) the respondents' highest level of education was found to be negatively connected with the availability of ICT in schools.

Theoretical Underpinnings

This study was anchored on the Technology Acceptance Theory by Fred Davis and Richard Bagozzi (1989). This theory supports the concept of ICT utilization in education. In relation to this theory, instructors' acceptance of ICT in math classes is impacted by how beneficial and simple they believe the technology to be. According to the Technology Acceptance Model (TAM), perceived utility and perceived ease of use are the two primary determinants of user acceptance and technology use. This relates to how much a teacher thinks that utilizing ICT would enhance both their efficiency as a teacher and the mathematical learning outcomes of their students. Perceived utility and simplicity of use are the two main criteria influencing a person's intention to employ new technology. According to Marikyan (2020), older adults who believe that digital games are a waste of time or too hard to play are unlikely to want to adopt this technology. On the other hand, those who believe that digital games are easy to learn and provide necessary mental stimulation are more likely to want to learn how to use them. Despite a number of criticisms, the Technology Acceptance Theory provides a helpful general framework that aligns with several studies on the factors influencing older individuals' intention to utilize new technology (Braun, 2016).

Objectives

This study aimed to determine the extent of ICT utilization in mathematics teaching in a district of a medium-sized schools division in central Philippines for the School Year 2024-2025 as basis for a capability building plan. Specifically, this study sought to answer the following questions: 1) the profile of the respondents in terms of the following variables: age, highest educational attainment, length of service, number of ICT trainings, and civil status; 2) the extent of ICT utilization in mathematics teaching according to the following areas: ICT Integration in Mathematics Instruction, Teacher Competency and Readiness, and Student Engagement and Learning Outcomes; and 4) if there is a significant difference in the extent of ICT utilization in mathematics teaching when grouped and compared according to aforementioned variables.

Methodology:

This section presents the discussion of the research methodology used, the subjects and respondents of the study, the research instruments used, the validity and reliability of the instruments, the procedure for data gathering, and the statistical tools and procedure for data analysis.

Research Design

This study used descriptive research design to determine the extent of ICT utilization in mathematics teaching in a district of a medium-sized schools division in central Philippines for the School Year 2024-2025 as basis for a capability building plan.

Descriptive research design method focuses on the present situation, and the purpose is to find the new truth. The truth may have different forms, such as an increased quantity of knowledge, a further generalization, or new "law," an improved insight into a factor (Calmorin, 2016).

Descriptive research design is used in this research as it aimed to collect information ad determining relationships without making any changes to the research topic, as its main concern is to determine and report the way things are.

Study Respondents

The respondents of the study are the 111 public elementary school teachers who are teaching Math in 7 schools in the said division. Since the number of respondents is quite large to handle, stratified sampling and random sampling technique was used and using Cochran formula to find the sample size. To get the percentage, the respondents coming from each section were divided by the total number of respondents and multiplied by the sample size. The respondents were randomly selected by the researcher from each section using the lottery technique.

Instruments

To determine the extent of ICT utilization in mathematics teaching in a district of a medium-sized schools division in central Philippines, this study made use of a self-made data-gathering instrument which was subjected to Validity (4.82 interpreted as “excellent”) and Reliability testing (0.764 interpreted as "good"). The questionnaire consisted of two parts: Part 1 gathered the respondents' socio-economic information, such as age, highest educational attainment, length of service, number of ICT trainings, civil status. Part 2 contained the questionnaire proper with 30-line items. There were 10-line items per area, with a total of 3 different areas from instructional supervision and technical assistance skills.

Data Gathering Procedure

The researcher first wrote a letter addressed to the Schools Division Superintendent informing her about this study, its purpose and general coverage and at the same time, seeking approval to conduct the study with the assurance that it will be done outside of school hours so as not to distract school routines.

After securing the approval of the SDS of the request, a letter addressed to the school heads was sent alongside a photocopy of the approved letter from the SDS. The administration of the data gathering instrument was done either lunch time or after school hours and the same were retrieved 2-3 after its distribution.

The raw data was collected and tallied into a single spreadsheet for further treatment. The said data were converted into numerical code guided by a coding manual. This will allow computer processing, statistical derivations and tabular presentation.

Data Analysis and Statistical Treatment

Objective No. 1 used descriptive analytical scheme and the statistical tools were frequency count and percentage distribution to determine the profile of the respondents in terms of age, highest educational attainment, length of service, and number of ICT trainings.

Objective No. 2 also used descriptive analytical scheme and the statistical tool used was Mean, to determine the extent of ICT utilization in teaching mathematics in terms of teacher integration in mathematics instruction, teacher competency and readiness, student engagement and learning outcomes, pedagogical approaches with ICT.

Objective No. 3 still used descriptive analytical schemes and Mean as the statistical tool, to determine the extent of ICT utilization in teaching mathematics when grouped according to aforementioned variables.

Objective No. 4 used comparative analytical and the statistical tool used scheme to determine if there is a significant difference in the extent of utilization of ICT utilization in teaching mathematics when grouped and compared according to aforementioned variables.

Ethical Consideration

Key ethical principles in conducting research studies were strictly observed by the researcher and it serived as guide in the use of human participants. These included providing the teachers, parents, and students with the necessary information to make a determination as to whether they want to be part of the study by taking surveys. The signing of the consent form, which is actually a process rather than an event was not used as coercive tool to compel participants to complete the study. The respondents were assured of their right to withdraw from the study at any point should they decide to. The identity of all respondents, as well as their responses were kept confidential such that neither the responses nor their identity was revealed to any other person outside the research team.

Results and Discussion:

This section deals with the presentation, analysis and interpretation of data gathered to carry out the objectives of this study. All these were made possible by following certain appropriate procedures so as to give the exact data and solution to each specific problem.

Profile of the respondents in terms of Age, Highest Educational Attainment, Length of Service, and Number of ICT Trainings

Table 1
Profile of Respondents

Variables	Categories	Frequency	Percentage
Age	Younger (below 35 years old)	54	48.65
	Older (35 years old and above)	57	51.35
	Total	**111**	**100**
Highest Educational Attainment	Lower (Bachelors' Degree)	72	64.86
	Higher (Masters and Doctorate Degree)	39	35.14
	Total	**111**	**100**
Length of Service	Shorter (less than 6 years)	56	50.45
	Longer (6 years and more)	55	49.55
	Total	**111**	**100**
Number of ICT Trainings	Few (less than 4 trainings)	67	60.36
	Many (4 and more trainings)	44	39.64
	Total	**111**	**100**

In terms of age, distribution of the respondents it is a quite balanced with 51.35% older people and 64.86% younger. A larger number of respondents who only have bachelor's degree suggests possible lack of specific expertise or research experience. This may indicate some gaps in the competency of teachers in the utilization of ICT-based instructions. As to their length of service, the distribution between the tenured and non-tenured respondents is almost at 50.45 the shorter group and 49.55 for the longer group. There is a not-so-wide disparity in the distribution of those with fewer ICT trainings at 60.36 versus those who have more trainings at 39.64. This implies that majority have limited ICT-related skills.

Extent of ICT utilization in mathematics teaching in the areas of ICT Integration in Mathematics Instruction, Teacher Competency and Readiness, Student Engagement and Learning Outcomes, and Pedagogical Approaches with ICT

Table 2
Extent of ICT utilization in mathematics teaching in the area of ICT Integration in Mathematics Instruction

Items	Mean	Interpretation
As a Math teacher, I …		
1. utilize available ICT platforms in delivering lesson contents.	3.91	Great Extent
2. create presentations and videos to support student-learning.	4.19	Great Extent
3. allow pupils to do their reports and assignments and submit them all to me online.	4.14	Great Extent
4. encourage learners to explore the internet to find related readings for our math lessons.	3.91	Great Extent
5. teach and allow learners to explore used Microsoft applications to help ease their learning process.	4.03	Great Extent
6. keep track of latest ICT updates and use them in delivering lessons in math.	3.65	Great Extent
7. encourage the class to utilize online chatting and video messaging with peers to discuss their projects and assignments.	4.06	Great Extent
Overall Mean	**3.98**	**Great Extent**

Table 2 shows the extent of ict utilization in mathematics teaching in the area of ict integration in mathematics instruction. The overall mean score 3.98, high level, implies that ICT is highly integrated into mathematics instruction.

The statement that states "Create presentations and videos to support student learning," had the highest mean score of 3.91. This indicates that multimedia materials are frequently incorporated into courses. To a large extent, the statement "Keep track of latest ICT updates for teaching" has the lowest mean (3.65). Teachers are always interested in staying current with new technology.

In this result, the areas where stronger ICT utilization is used is indicated by high mean scores, which imply that teachers feel at ease incorporating digital technologies into their lessons. Even if ICT use is now at a "Great Extent," educators might investigate more dynamic and adaptable technologies like gamified learning, AI-powered platforms, and sophisticated data analytics. Regular professional development sessions may guarantee that teachers stay proficient in new educational technologies, especially since ICT is developing quickly. Promoting collaborative platforms and cutting-edge ICT solutions can improve students' learning experiences, as they are already encouraged to use online resources.

In one of the districts of a large division in the Province of Negros Occidental, Guanzon (2020) carried out a study on the information and communication technology competency, efficacy, and proficiency of instructors. This study focused on three primary topics: teachers' proficiency in two (2) areas, namely ICT lesson design and ICT session facilitation; teachers' efficacy in two (2) areas, namely instructional methods and instructional assessments; and teachers' competency in two (2) areas, namely software application and online resource utilization. The results demonstrated that teachers' proficiency, efficacy, and competency were all at high levels. Moreover, the findings demonstrated a noteworthy variation in the proficiency, efficacy, and competency of teachers.

Table 3
Extent of ICT utilization in mathematics teaching in the area of Teacher Competency and Readiness

Items	Mean	Interpretation
As a Math teacher, I …		
1. attend ICT-related seminar and workshops and train on how to integrate the same in teaching math.	4.17	Great Extent
2. possess the necessary skills to deliver lesson contents using ICT platforms.	3.91	Great Extent
3. teach learners on how to make use of built-in formulas of Microsoft excel.	3.68	Great Extent
4. use appropriate ICT tool necessary for each Math topic.	3.89	Great Extent
5. share background information of useful math applications with co-teachers.	3.77	Great Extent
6. understand the relationship of ICT tools and Mathematical teaching.	4.09	Great Extent

7. take time in assessing how ICT affects students' learning in Math as a normal reflective process.	3.32	Moderate Extent
Overall Mean	**3.83**	**Great Extent**

As presented in Table 3, the over-all mean score of 3.83, interpreted as high shows that math teachers are highly proficient in ICT utilization and they are prepared to incorporate digital technologies in every day class. In some areas, however, there is a need for teachers to consider ICT effectiveness, for example with the Excel formula integration, may use more attention.

Highest-rated mean of 4.17, high level, on the line-item that states, "Teachers actively attend ICT-related seminars and workshops" and this shows a deeper and stronger commitment to career progress or professional development. Lowest-rated item which 3.32, moderate, on-line item which states "Assessing ICT's impact on student learning" reveals moderate practice or use of ICT-based instructions which implies that teachers need for more technical support to become more effective. This could be an indication that given more technical support and trainings, teachers' competence will be greatly improved. This also indicates the need to have a sustained and advanced ICT workshops to ensure that teachers stay updated with emerging educational technologies. While ICT skills are well-developed, deeper integration of Microsoft Excel's built-in formulas could further support data analysis and computational learning in math classrooms.

In a similar study, Montero (2020) also investigated teachers' utilization of ICT-based learning resources in connection with learners' academic performance in one of the large-sized division in Central Negros Occidental for the School Year 2020-2021. The area considered for this study include: Productivity Application Software, Facilities and Equipment and Internet and Network Application. The variables included are: age, civil status, highest educational attainment and length of service. The result of the study showed that Extent of Teachers' Utilization of ICT-Based Learning in the areas of Productivity Application Software, Facilities and Equipment and Internet and Network Application Resources were all at great extent. In the area of productivity application software, the result of the study showed that some teachers lack the mastery in using Microsoft Excel. In the area of Facilities and Equipment, the study showed that the respondents were concerned that limited supplies and resources were not properly managed. In terms of internet and network application resources, the respondents showed that there was an issue accessing learning resource websites.

Table 4
Extent of ICT utilization in mathematics teaching in the area of Student Engagement and Learning Outcomes

Items	**Mean**	**Interpretation**
As a Math teacher, I …		
1. formulate questions that explores ICT learning opportunities specific for math lessons.	3.84	Great Extent
2. encourage critical thinking and show the value of collaboration in the class.	3.44	Moderate Extent
3. teach learners to analyze on their own useful ICT applications.	3.81	Great Extent
4. assist learners in solving math problems using formulas available online.	4.43	Great Extent
5. teach students to challenge mathematical ideas using available ICT tools.	3.95	Great Extent
6. compare results of students' performance with and without ICT integration in class.	4.13	Great Extent
7. lead students to reflect on dynamic representations of abstract mathematical concepts.	3.75	Great Extent
Overall Mean	**3.91**	**Great Extent**

Table 4 reveals the extent of ICT utilization in mathematics teaching in the area of Student Engagement and Learning Outcomes. The data suggests that ICT plays a significant role in enhancing student engagement and learning outcomes in mathematics. The overall mean of 3.91 (Great Extent) reflects strong integration of digital tools to support instruction. Furthermore, ICT enhances mathematics instruction effectively, particularly in problem-solving and performance evaluation.

The highest-rated item (4.43) shows that teachers actively assist students in solving math problems using online formulas, highlighting strong reliance on digital tools for computational learning. Meanwhile, the Lowest-rated item (3.44) means that encouraging critical thinking and collaboration is integrated at a moderate extent, suggesting room for improvement in fostering interactive and problem-solving discussions.

This implies that since collaboration and critical thinking have the lowest rating, integrating interactive ICT tools (e.g., problem-solving forums, gamified platforms, group-based math simulations) can enhance these areas. Since teachers assess performance differences between ICT-integrated and traditional teaching methods, this data can be

leveraged to refine ICT implementation strategies for better learning outcomes. Teachers lead students in reflecting on abstract mathematical concepts using ICT (3.75), indicating potential for further innovation in visual-based learning (e.g., interactive modeling, virtual simulations).

The study of Paje, et al. (2021) investigated teachers' utilization of computer-based technology. The respondents were the 41 science teachers in two state-owned secondary schools in Zambales, Philippines. Based on the findings, the computer-based technology (CBT) in science instruction is a trend in the 21st -century learning. The results showed that most of the teachers utilized CBT in instruction to improve their teaching that significantly uplifts students' learning interests and concept understanding. However, teachers have issues due to poor ICT literacy due to non-updating, unstable internet connection, power interruption, and sometimes they find it too expensive to use the CBT. The study recommends ICT training-workshop and encourages teachers to utilize appropriate CBT instruction based on the context of the students.

Table 5
Extent of ICT utilization in mathematics teaching in the area of Pedagogical Approaches with ICT

Items	Mean	Interpretation
As a Math teacher, I …		
1. use appropriate ICT tool necessary for each Math topic.	3.86	Great Extent
2. integrate available ICT-related tools in teaching Math.	4.32	Great Extent
3. apply basic ICT operations in the class to enhance learners understanding of mathematical concepts.	4.21	Great Extent
4. check and compare new approaches with old ones in teaching mathematics	3.73	Great Extent
5. gather improvement results of learners in math to reflect on "what's working and what's not".	4.03	Great Extent
6. use whole class teaching to provide examples and non-examples of mathematical concepts in ICT formats.	4.05	Great Extent
7. help students resolve mathematical problems with ICT tools.	3.58	Great Extent
Overall Mean	**3.97**	**Great Extent**

Table 5 shows the Extent of ICT utilization in mathematics teaching in the area of Pedagogical Approaches with ICT. The data shows that ICT is integrated into mathematics teaching to a great extent, with an overall mean of 3.97. The highest-rated item, "Integrate available ICT-related tools in teaching Math" (4.32), suggests that teachers are actively leveraging digital tools to enhance instruction. Meanwhile, the lowest-rated item, "Help students resolve mathematical problems with ICT tools" (3.58), indicates a relatively lower emphasis on using technology directly for problem-solving. This implies that the teachers may need to incorporate more specialized problem-solving software (e.g., GeoGebra, Desmos, Wolfram Alpha) to assist students in tackling mathematical problems using digital tools. Additionally, the lowest mean score suggests students might not be fully equipped to independently navigate ICT tools for problem-solving. Providing structured exercises where students actively use technology to solve math problems can boost their confidence and competence. In today's generation with increasing demand of technology, it is very hard for teachers to get students attention when lessons are not connected with computer related programs. There are instances that students do not engage well in classroom discussions which later resulted to poor academic performance. It is a must for 21st century teachers to acquire computer skills to cope up with the needs of 21st century learners. The 21st century teacher should be flexible and adapt with the changing industry. They may use different computer and computer applications that can help the learners to be motivated and to be interested. Using computer-based technology must be further strengthened so that competent 21st century learners will be produced (Baterna, 2020).

Comparative analysis in the extent of ICT utilization in mathematics teaching in the areas of ICT Integration in Mathematics Instruction, Teacher Competency and Readiness, Student Engagement and Learning Outcomes, and Pedagogical Approaches with ICT when grouped and compared according to Age, Highest Educational Attainment, Length of Service, and Number of ICT Trainings

Table 6
Difference in the extent of ICT utilization in mathematics teaching in the area of ICT Integration in Mathematics Instruction when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann Whitney U	p-value	*Sig. Extent*	Interpretation
Age	Younger	54	58.74	1391.000	0.376	0.05	Not Significant
	Older	57	53.40				
	Lower	72	56.30	1382.500	0.893		Not Significant

Highest Educational Attainment	Higher	39	55.45				
Length of Service	Shorter	56	58.63	1393.000	0.379		Not Significant
	Longer	55	53.33				
Number of ICT Trainings	Few	67	58.10	1333.000	0.389		Not Significant
	Many	44	52.80				

Table 6 shows the result of the comparative analysis to determine the difference in the extent of ICT utilization in mathematics teaching in the area of ICT Integration in Mathematics Instruction when grouped and compared according to variables. The data suggests that age, educational attainment, length of service, and number of ICT trainings do not significantly impact ICT utilization in mathematics teaching. This conclusion is based on the *p*-values (age=0.376, highest educational attainment = 0.893, length of service = 0.379, and the number of ICT training = 0.389), are all greater than 0.05, indicating that differences between groups are not statistically significant. This result indicates the need to focus on personalized ICT support. Since demographic factors do not significantly influence ICT utilization, training programs should focus on individual skill enhancement rather than targeting groups based on age or experience. Additionally, there is a need to encourage continuing ICT Innovation. According to Dogan (2021), a considerable number of resources, reform efforts, and policy changes have been made to equip K-12 schools with technology that enables all students to be successful. As the access to technology, software, and application has been granted, accordingly, more and more educators and researchers have paid attention to technology integration and use. Given this increasing interest in technology and its use over the two decades, the understanding of teachers' viewpoints and perceptions about technology use in K-12 settings has been of utmost importance.

Table 7
Difference in the extent of ICT utilization in mathematics teaching in the area of Teacher Competency and Readiness when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann Whitney U	p-value	*Sig. Extent*	Interpretation
Age	Younger	54	57.84	1439.500	0.553		Not Significant
	Older	57	54.25				
Highest Educational Attainment	Lower	72	52.83	1176.000	0.154	0.05	Not Significant
	Higher	39	61.85				
Length of Service	Shorter	56	58.33	1409.500	0.436		Not Significant
	Longer	55	53.63				
Number of ICT Trainings	Few	67	56.10	1467.500	0.968		Not Significant
	Many	44	55.85				

Table 7 shows that results for age, highest educational attainment, length of service, and number of ICT trainings do not significantly impact teacher competency and readiness in integrating ICT into mathematics instruction. This conclusion is based on *p*-values (age = 0.553; highest educational attainment = 0.154, length of service = 0.436, and 0.968), all of which are greater than 0.05, indicating no statistically significant differences between groups. ICT integration in education generally means technology-based teaching and learning process that closely relates to the utilization of learning technologies in schools. Due to the fact that students are familiar with technology and they will learn better within technology-based environment, the issue of ICT integration in schools, specifically in the classroom is vital. This is because, the use of technology in education contributes a lot in the pedagogical aspects in which the application of ICT will lead to effective learning with the help and supports from ICT elements and components. It is right to say that almost all ranges of subjects' start from mathematics, science, languages, arts and humanistic and other major fields can be learned more effectively through technology-based tools and equipment. In addition, ICT provides the help and complementary supports for both teachers and students where it involves effective learning with the help of the computers to serve the purpose of learning aids (Gravifikr, 2018).

Table 8
Difference in the extent of ICT utilization in mathematics teaching in the area of Student Engagement and Learning Outcomes when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann Whitney U	p-value	*Sig. Extent*	Interpretation

Age	Younger	54	56.45	1514.500	0.884	0.05	Not Significant
	Older	57	55.57				
Highest Educational Attainment	Lower	72	55.46	1365.000	0.808		Not Significant
	Higher	39	57.00				
Length of Service	Shorter	56	56.39	1518.000	0.896		Not Significant
	Longer	55	55.60				
Number of ICT Trainings	Few	67	58.85	1283.000	0.246		Not Significant
	Many	44	51.66				

Table 8 revealed that age, highest educational attainment, length of service, and number of ICT trainings do not significantly impact the extent of ICT utilization in student engagement and learning outcomes in mathematics teaching. This conclusion is based on p-values, all of which are greater than 0.05, signifying those differences between these categories are not statistically significant. There is no significant difference across all variables. This implies that age, Highest Educational Attainment, average family monthly income and number of siblings do not strongly influence digital teaching strategies for learning outcomes. Nguli, et al. (2018) examined the influence of teacher demographic factors on ICT integration in teaching within ICT Champion Schools in Kenya. Their study found that while age, gender, and education level had some correlation with ICT adoption, the overall impact was not strongly significant, suggesting that institutional support and training programs play a more crucial role in successful ICT integration.

Table 9
Difference in the extent of ICT utilization in mathematics teaching in the area of Pedagogical Approaches with ICT when grouped and compared according to variables

Variable	Category	N	Mean Rank	Mann Whitney U	p-value	*Sig. Extent*	Interpretation
Age	Younger	54	61.06	1266.000	0.105	0.05	Not Significant
	Older	57	51.21				
Highest Educational Attainment	Lower	72	55.10	1339.500	0.689		Not Significant
	Higher	39	57.65				
Length of Service	Shorter	56	61.27	1245.000	0.080		Not Significant
	Longer	55	50.64				
Number of ICT Trainings	Few	67	57.41	1379.500	0.567		Not Significant
	Many	44	53.85				

Table 9 reveals that age, highest educational attainment, length of service, and number of ICT trainings do not significantly impact ICT utilization in pedagogical approaches for mathematics instruction. This conclusion is drawn from the p-values, all of which are greater than 0.05, showing that differences between these groups are not statistically significant. There were no significant differences across all variables which implies that age, highest educational attainment, length of service and number of ICT trainings does not strongly influence ICT-based pedagogical strategies. The study by Ocampo and Lucasan (2019) explores key issues in instruction, teacher professional development, and ICT integration in basic education in the Philippines. One of the key findings is that school support is crucial to the successful implementation of ICT-based teaching strategies.

Conclusions:

The distribution of respondents revealed a balanced distribution as to age, highest educational attainment and number of ICT training, with a notable gap when grouped according to the number of ICT trainings. The findings indicate that ICT utilization in mathematics teaching across the areas of ICT Integration in Mathematics Instruction, Teacher Competency and Readiness, Student Engagement and Learning Outcomes, and Pedagogical Approaches with ICT is consistently practiced to a great extent. This suggests that educators are actively incorporating digital tools and methods into their teaching, demonstrating a strong commitment to leveraging ICT for enhanced instruction and student engagement. While the extent of utilization is high, ongoing training, innovation, and strategic improvements can further optimize the effectiveness of ICT in mathematics education. The comparative analysis of ICT utilization in mathematics teaching across the areas of ICT Integration in Mathematics Instruction, Teacher Competency and Readiness, Student Engagement and Learning Outcomes, and Pedagogical Approaches with ICT, when grouped and compared according to Age, Highest Educational Attainment, Length of Service, and Number of ICT Trainings, revealed no significant difference. This indicates that these demographic and professional variables do not notably impact the extent to which ICT is integrated into mathematics instruction. The findings suggest that teachers,

regardless of their background or level of training, consistently adopt and apply ICT in their teaching practices to a great extent, reinforcing the universal importance of digital tools in mathematics education.

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