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Project TechMATES as a Mentoring Program for the Enhancement of Basic Computer Literacy

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A B S T R A C T

Project TechMATES was designed as a mentoring program to enhance the basic computer literacy of students at Cotta National High School. Many of the learners at this school come from socioeconomically disadvantaged backgrounds and have limited access to digital tools and technology at home. The program focused on equipping students with essential ICT skills in Microsoft Word, PowerPoint, Excel, Publisher, basic troubleshooting, and internet use.

Using a quasi-experimental one-group pretest-posttest research design, the study evaluated students' digital competencies before and after the intervention. Pre-test results revealed generally low to moderate levels of ICT proficiency, with significant deficiencies in Microsoft Excel and basic troubleshooting.

Following the implementation of Project TechMATES, post-test results indicated substantial improvements in students' skills across all areas. Competency levels rose to very good and excellent categories, demonstrating the program's strong impact. Statistical analysis supported these outcomes, showing a highly significant increase in ICT skills, with p-values less than .001 for all competencies measured.

The results affirm the effectiveness of Project TechMATES in improving digital literacy through structured mentoring. The study highlights how well-designed ICT programs can close technological gaps and boost students' academic and professional readiness. By providing practical, hands-on training, Project Tech MATES not only built technical competence but also empowered learners to confidently navigate digital platforms.

This research underscores the vital role of continuous ICT education, especially in underserved communities, in preparing students for future academic pursuits and career opportunities in an increasingly digital world.

Keywords: Tech MATES, Computer Literacy, ICT Proficiency, ICT Skills, Technology Gaps

1. Introduction

Computers are essential for anyone hoping to blend in with 21st-century society because they impact lives around the globe. As though they are necessary for every undertaking, whether educational, professional, or personal, computers now have a massive impact on every activity and aspect of people in the community and society.

Cohen (2015) states that computer literacy is crucial for everyone, especially students. Reynolds (2018) defines computer literacy as the capacity to understand how modern computers and internet connectivity can enhance students' learning experiences of hardware and software manipulation and troubleshooting. He implies that the basic understanding of how to use computers and related gadgets, like smartphones and tablets, is also essential. As a result, computer literacy enables students to adjust to the rapidly changing technological environment.

Many people, especially those who were not raised in a technologically advanced environment, find it difficult to understand the systems needed for computer literacy. The use of computers requires the development of specific cognitive and technical abilities to understand symbols and texts, and the ability to solve problems, all of which are not always obvious to people who know how to use computers intuitively. Computer proficiency used to be regarded as an elective. Computer literacy is an essential skill for progress in education, the workplace, and everyday life (MathGenie, 2018).

Even though children nowadays are sometimes referred to as "digital natives," socioeconomic and familial norms can influence the ability of a child to develop age-appropriate computer utilization and content creation. Tablets, laptops, and Personal Computers are increasingly being used in classrooms for 21st-century digital learning. Because technology-related skills are necessary in the real world, they are becoming increasingly important in K–12 education (Mbaeze, Ukwandu, & Anugu, 2010). If learners did not learn age-appropriate computer skills like typing, online research, and responsible internet usage, they run the risk of falling behind in their classes and struggling to maintain their grades.

According to MathGenie (2018), these difficulties might even last into adulthood. There are many different levels of computer literacy, ranging from basic computer operations to complex programming, and a parent may not realize that their child has fallen behind. Make sure someone can comprehend the foundations of computer literacy, navigate a computer through menus and search engine functions, use an operating system, execute software applications, establish an internet connection, and turn a computer on and off (Leonard, 2019). Therefore, the process by which a student demonstrates their ability to perform basic computing tasks at the school level is known as computer competency. To demonstrate competence in basic computer operations, a student can demonstrate proficiency with Microsoft Word (document productions), Excel (formula and automatic computing), PowerPoint (slide presentations), and basic computing skills.

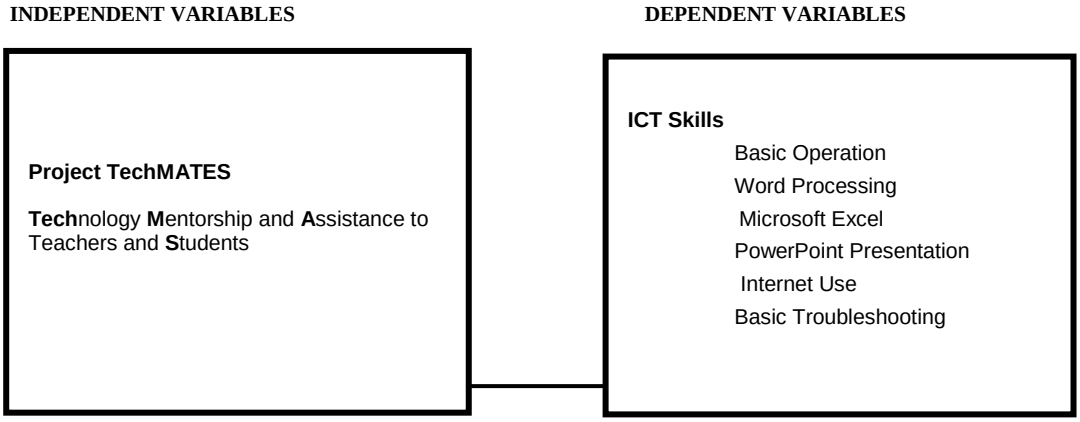

Figure 1. Research Paradigm

2. Research Problem

The researcher aimed to determine the effectiveness of *Project TechMATES* as a mentoring program in enhancing basic computer literacy among participants.

Specifically, this study sought to answer the following questions:

1. What is the level of ICT Literacy among the respondents?

2. What is the mean pretest and posttest of the respondents before and after the implementation of Project TechMATES?

3. Is there a significant difference in the mean pretest and posttest of the respondents before and after the implementation of Project TechMATES?

3. Materials and Methods

Research Design

One quasi-experimental research methodology was used in this study: a one-group pretest-posttest design. Participants' performance was assessed both before and after the intervention to assess the impact of the independent variable, in this case, TechMATES (Technology Mentorship and Assistance to Teachers and Students). The project aimed to enhance participants' ICT skills, which include Basic Operation, Word Processing, Microsoft Excel, PowerPoint Presentation, internet use, and basic troubleshooting. The dependent variable was assessed through pretest and posttest scores, providing quantitative data to measure improvement. By focusing on the changes observed within the group, the study sought to determine the effectiveness of TechMATES in developing essential ICT competencies.

Respondent /Participants

The respondents for this study consisted of two Grade 9 sections from Cotta National High School, selected based on availability and shared characteristics. Each section was chosen to ensure comparable academic performance and prior exposure to technology-related courses, helping maintain consistency between groups. A total of 75 respondents were included, determined to meet the required sample size with a 95% margin of error to enhance the reliability of the findings. Efforts were made to control external factors, such as class schedules, access to resources, and teacher expertise, to minimize the influence of confounding variables. This careful selection and sampling process ensured the validity of the study by creating a stable environment for assessing the impact of the intervention.

Instruments of the Study

The ICT proficiency of Grade 9 students was assessed using a pretest-posttest questionnaire. The questionnaire assessed fundamental skills like basic operations, word processing, Microsoft Excel, PowerPoint presentations, internet use, and basic troubleshooting. To ensure consistency in evaluating the students' development before and after the TechMATES intervention was implemented, similar sets of questions were used in the pretest and posttest of this research study.

The structured questionnaire, which consisted of performance-based activities and multiple-choice questions, provided objective and helpful assessments of the students' skills. It passed a pilot test to ensure reliability and clarity, and ICT experts validated the content to ensure the items' correctness and applicability. The students' scores on both tests were also collected and analyzed to determine the effectiveness of the Project TechMATES intervention. The instruments were designed to measure both knowledge and the practical application of ICT skills to guarantee a comprehensive evaluation.

Procedure

The research process for the study was carried out methodically, beginning with obtaining the necessary authorizations. A formal consent letter was written and sent to the Division Office, stating the study's objectives, methodology, and benefits for the school and its students. Approval from the Division Office was necessary to ensure that the research adheres to compliance with educational policies and that it aligns with the academic goals. To plan the practicalities of the study, including participant selection and assessment scheduling, communication was initiated with the teachers and school administration after obtaining the necessary authorizations. After establishing the administrative foundation, is administration diagnostic test was developed for twenty nonrespondents. This test was designed to ascertain the students' current levels of ICT literacy. After the diagnostic test, the experts checked the data and validated the instrument to decide if the items were accepted or rejected. Following the advice of the experts, the researcher then gave the pretest to 75 Grade 9 students. The results of the pretest provided valuable information that was later used to evaluate the effectiveness of the project. A posttest assessment tool was developed to determine the project's impact. This assessment was designed to closely resemble the pretest in order to account for the specific ICT interventions used during the study. To ensure the accuracy and reliability of the assessment, subject matter experts validated it. To ensure that the test was appropriate for Grade 9 students and accurately measured the intended outcomes, these experts looked at its content validity.

Finally, the posttest was administered to the same group of students after the ICT-integrated lessons were delivered. The posttest results were compared with the pretest data to determine whether the students' ICT skills had changed. Using statistical analysis, the significance of the observed changes was determined, providing insight into the project's effectiveness in the teaching-learning process at Cotta National High School. The results of the study may impact future educational practices, policies, and regulations both inside and outside of educational institutions.

Data Analysis

The mean percentage score was used in Project TechMATES to determine the level of ICT literacy because it provides a precise, quantifiable indicator of participants' performance and development. This statistic showed the pre-test and post-test results and the skills gained after the mentorship program. Using percentage scores, it was simple to ascertain the extent to which participants had mastered the desired competencies. Because it allows mentors to assess the effectiveness of their advice and identify areas that might need more support, this approach has proven particularly useful in mentoring programs. Overall, the mean percentage score was a reliable indicator of how well the training enhanced basic computer literacy.

The dependent t-test assessed how well the mentoring program enhanced basic computer literacy and was appropriate for Project TechMATES since it compared the pre-test and post-test results of the same participant group. This test determined whether the observed changes in scores are statistically significant by explaining the paired nature of the data. Since the program's objective was to improve individual abilities through mentorship, the dependent t-test evaluated the intervention's direct impact on each participant. By looking at the mean differences between the pre-test and post-test, it showed how well the program achieved its objectives. It is ideal in this case because it ensures that the evaluation focuses on the growth of the individual rather than comparing unrelated groups.

4. Result and Discussions

This section presents the findings according to the study's research questions. They were presented in the form of tables and gave the reader a concrete and itemized view of the item.

Table 1.1 Level of ICT Literacy among the respondents

Scores	Level of Literacy in the Pre-Test												
	Basic Operation		Word Processing		Microsoft Excel		Microsoft Powerpoint		Internet Use		Basic Troubleshooting		Interpretation
	f	*%*	*f*	*%*	*f*	*%*	*F*	*%*	*F*	*%*	*F*	*%*	
9-10	-	-	-	-	-	-	-	-	-	-	-	-	Excellent
7-8	15	20.0	2	2.7	3	4.0	2	2.7	10	13.3	12	16.0	Very Good
5-6	35	46.7	19	25.3	12	16.0	21	28.0	17	22.7	14	18.7	Good
3-4	22	29.3	37	49.3	36	48.0	36	48.0	34	45.3	33	44.0	Fair
0-2	3	4.0	17	22.7	24	32.0	16	21.3	14	18.7	16	21.3	Poor
Total	75	100	75	100	75	100	75	100	75	100	75	100	

Legend: 9 – 10 Excellent; 7-8 Very Good; 5-6 Good; 3 - 4 Fair; 0-2 Poor

Data shows from the table illustrates level of literacy among respondents in the pre-test, assessing their skills in Basic Computer Operations, Word Processing, Microsoft Excel, Microsoft PowerPoint, Internet Use, and Basic Troubleshooting. The results indicate that before any intervention or training, a significant portion of respondents had only a moderate or low level of competency in these areas. Remarkably, no students scored in the 9-10 range (Excellent) across all skills, highlighting a gap in advanced digital proficiency. The majority of students fall within the Fair (3-4 scores) and Poor (0-2 scores) categories, particularly in Microsoft Excel (48% Fair, 32% Poor), Word Processing (49.3% Fair, 22.7% Poor), and Microsoft PowerPoint (48% Fair, 21.3% Poor). This suggests significant struggles with productivity software, which is critical for academic and professional tasks.

Basic Troubleshooting and Internet Use also show concerning trends, with 44% and 45.3% of students in the Fair category, respectively. These findings suggest that many learners have only minimal competency in resolving basic technical issues and navigating online platforms efficiently. Meanwhile, Basic Operation has a relatively stronger performance, with 46.7% in the Good category and 20% in Very Good, indicating that foundational computer skills are more familiar to students compared to specific software applications.

According to Jenkins et al. (2021), digital literacy remains a challenge in many educational institutions, particularly in developing countries, where access to technology and formal ICT training is limited. Similarly, Eshet-Alkalai (2019) emphasizes that students often have fragmented ICT skills, excelling in social media use but struggling with formal digital tools like spreadsheets and document processing. Moreover, a study by Ng (2012) highlighted that digital literacy is multifaceted, encompassing technical, cognitive, and socio-emotional dimensions. Ng's study found that while students are often considered "digital natives," their competency in software tools such as Microsoft Office applications remains limited, especially in areas like Excel and PowerPoint. This supports the observation in the table where a large percentage of students scored only Fair or Poor in Microsoft Excel (48.0%) and PowerPoint (57.3%).

According to UNESCO (2018), ICT literacy is a key component of 21st-century skills, enabling learners to access, manage, and evaluate digital information effectively. However, the same report emphasizes that many students, particularly in developing regions, possess only foundational digital skills, which aligns with the results presented in the table, where a significant number of students scored within the 3–6 range across various ICT domains.

It conforms to the study of Almerino et al. (2011) states that high school students in the Philippines lacked proficiency in fundamental ICT skills due to insufficient training and limited access to technology. This is consistent with the findings in Table 1.1, which indicate that over 70% of participants scored below the good range in critical areas such as Internet use, word processing, and basic troubleshooting.

Furthermore, Cervantes et al. (2015) concluded that hands-on training and integration of ICT into classroom activities significantly improved students' digital literacy. The researcher's study emphasized the need for continuous professional growth, development, and structured ICT programs in schools to bridge the digital divide.

Table 1.2 Level of ICT Literacy among the respondents

Scores	**Level of Literacy in the Post-Test**												
	Basic Operation		**Word Processing**		**Microsoft Excel**		**Microsoft Power point**		**Internet Use**		**Basic Troubleshooting**		**Interpretation**
	F	*%*	*F*	*%*	*F*	*%*	*F*	*%*	*f*	*%*	*F*	*%*	
9-10	25	33.3	34	45.3	30	40.0	34	45.3	29	38.7	37	49.3	Excellent
7-8	50	66.7	41	54.7	45	60.0	41	54.7	46	61.3	38	50.7	Very Good
5-6	-	-	-	-	-	-	-	-	-	-	-	-	Good
3-4	-	-	-	-	-	-	-	-	-	-	-	-	Fair
0-2	-	-	-	-	-	-	-	-	-	-	-	-	Poor
Total	75	100	75	100	75	100	75	100	75	100	75	100	

Legend: 9 – 10 Excellent; 7-8 Very Good; 5-6 Good; 3 - 4 Fair; 0-2 Poor

The data shows post-test results assessing the level of ICT literacy among 75 respondents across six skill areas: Basic Operations, Word Processing, Microsoft Excel, Microsoft PowerPoint, Internet Use, and Basic Troubleshooting. Notably, all participants scored within the "Very Good" (7-8) and "Excellent" (9-10) categories, with no one falling into "Good," "Fair," or "Poor" classifications. This indicates that the implementation of Project TechMATES was highly effective in enhancing digital skills.

A significant proportion of respondents demonstrated strong competencies, particularly in Microsoft Excel, where 40% scored "Excellent". This can be attributed to several hands-on activities under Project TechMATES. Participants were taught to navigate the Excel interface, use basic functions like SUM, AVERAGE, and IF, and create simple formulas such as =A1+B1. They also explored more advanced features, including Freeze

Panes, Protect Sheet, and AutoRecover. The training also covered creating visual data representations, such as line graphs, bar charts, and pie charts, which helped learners develop deeper insights into data management.

In Internet Use, where 61.3% of participants scored "Very Good", the training focused on using browsers like Google Chrome, Mozilla Firefox, Safari, and Edge. Participants learned about safe browsing habits, such as recognizing HTTPS for secure communication and avoiding suspicious websites. Sessions also explored search engine mechanisms (Google, Bing, Yahoo), the meaning of terms like WWW and 404 errors, and how to effectively use the edu.ph domain for educational resources. Furthermore, online platforms for collaboration, research, and communication were introduced, providing practical exposure to internet functionality in real-life contexts.

For Microsoft PowerPoint and Word Processing, where 45.3% achieved "Excellent", students were immersed in activities that strengthened their document creation and presentation skills. In Microsoft Word, they learned to format text, insert images, adjust page layouts, and use shortcut keys for efficiency. More advanced lessons included how to insert headers and footers, create bulleted lists, apply justify alignment, bold important text, and switch page orientations via the Layout tab. These skills ensured not just competence but also professional-level formatting abilities.

Similarly, in Microsoft PowerPoint, the training covered slide design, animations, transitions (from fades to morphs), and multimedia integration. Learners explored how to insert charts (e.g., pie charts, bar graphs), apply design themes, and use Presenter View for effective delivery. They also gained experience with using templates and structured layouts like title slides and comparison slides—equipping them with the tools to create engaging and well-structured presentations.

In the area of Basic Operations, learners were first introduced to essential hardware concepts, such as the Central Processing Unit (CPU) and input devices. They were also guided on how to turn on and set up a desktop computer, transfer files using a flash drive, and perform basic tasks like adjusting computer volume and recovering deleted files. These foundational tasks helped ensure students were comfortable navigating and managing a computer system independently.

Finally, Basic Troubleshooting results showed a balanced distribution, with 49.3% scoring "Excellent" and 50.7% scoring "Very Good", reflecting strong capabilities in resolving technical problems. The training sessions walked participants through common issues like a computer failing to start (checking power and cables), internet connectivity problems (checking modem/router settings), and peripheral errors (like USB and printer issues). Learners were also taught to use Task Manager to manage system processes and perform troubleshooting such as driver checks, port switching, and clearing printer queues—all essential for maintaining system functionality.

These findings are in line with past research that emphasizes the significance of digital computer literacy for professional and academic settings. Eshet-Alkalai (2004) asserts that digital literacy encompasses both the technical and cognitive abilities required to effectively use digital tools. People with high levels of digital literacy are better equipped to adapt to new technological advancements, which increases their employability and productivity, per a study by Ng (2012). By demonstrating that respondents have had adequate training or prior experience with computer applications, the high literacy levels found in this survey reflect the growing emphasis on digital proficiency in education and career development.

The post-test results indicate that respondents have strong digital literacy skills, particularly in Microsoft Office applications and internet use, with none scoring below the "Very Good" category. These findings underscore the effectiveness of digital literacy programs and the need to continue integrating technology into learning environments to maintain high competency levels.

According to Haddad and Draxler (2002), properly implemented ICT interventions in education can enhance learning outcomes by increasing student engagement and supporting individualized instruction. Their findings align with the outcomes in the table, which reflect that intentional and well-designed ICT instruction has a positive effect on students' digital competencies.

A study by Pelgrum and Law (2003) emphasized that hands-on ICT integration in classroom activities results in higher student mastery of basic computer functions and productivity tools. The post-test results in Table 1.2 reflect this, as a high percentage of respondents scored within the 7–10 range across all areas, with Internet Use (100%) and Basic Troubleshooting (100%) seeing significant growth from their pre-test levels.

Tondeur et al. (2017) further supported this by showing that sustained ICT-related professional development and learner-centered practices lead to improvements in both teacher competence and student digital literacy. The rise in the number of students scoring “Excellent” in areas like Microsoft Excel (40%) and Microsoft PowerPoint (45.3%) indicates that skills which were previously weak in the pre-test have shown measurable progress after structured exposure.

Locally, Buabeng-Andoh (2012) observed that ICT training programs in schools helped bridge the digital skills gap among students and improved academic outcomes. The total absence of scores in the Fair, Poor, or even Good ranges in Table 1.2 supports this claim, suggesting a transformative impact of the ICT literacy program implemented.

Finally, UNESCO (2020) stressed the value of digital computer literacy in preparing students for a knowledge-based economy. Thus, the table presentation in this research paper illustrates how targeted ICT initiatives may prepare and ready students for the demands of the modern world digitalization by showing the shift from low pre-test competency levels to high post-test competency levels.

Table 2: Mean pretest and posttest of the respondent before and after the implementation of Project TechMATES

ICT Skills	Pre-Test		Post-Test	
	Mean	SD	Mean	SD
Basic Operation	5.08	1.59	8.24	0.80
Word Processing	3.68	1.56	8.36	0.78
Microsoft Excel	3.27	1.62	8.37	0.61
Microsoft Powerpoint	3.75	1.40	8.35	0.67
Internet Use	4.19	1.78	8.21	0.83
Basic Troubleshooting	4.22	1.97	8.49	0.96

The table presents the mean scores and standard deviations (SD) of the respondents' ICT proficiency on the pre-test and post-test following the implementation of ProjectTechMATES. The results indicate a significant improvement in all ICT skill domains because the post-test mean scores were higher than the pre-test mean scores.

Before the intervention, the respondents exhibited low to moderate proficiency in various ICT skills, with the lowest mean score recorded in Microsoft Excel (M = 3.27, SD = 1.62) and word processing (M = 3.68, SD = 1.56). Basic operations, internet use, and troubleshooting had slightly higher pre-test mean scores, but they remained below proficient levels. These findings align with prior studies suggesting that many learners, particularly those with limited exposure to technology, struggle with advanced digital tasks (Van Deursen & Van Dijk, 2014).

The post-test results showed a significant increase after Project TechMATES was implemented, with all mean scores increasing to above 8.20. This suggests that respondents accomplished very good to excellent proficiency in all ICT competencies. Basic troubleshooting had the highest post-test mean score (M = 8.49, SD = 0.96), which was significantly higher than the pre-test mean (M = 4.22, SD = 1.97). Additionally, there was a notable increase in Microsoft Excel (M = 8.37, SD = 0.61), demonstrating the importance of structured instruction in improving spreadsheet literacy—a skill that many students struggle with (Bennett et al., 2012).

These findings support literature that emphasizes the effectiveness of ICT-focused training programs in enhancing digital skills. According to Prensky (2001), structured interventions help bridge the digital literacy gap by providing learners with guided, hands-on experience. Similarly, Clark and Feldon (2014) argue that technology-based education significantly improves students' ability to engage in self-directed learning and problem-solving.

Almerino et al. (2011) found that when Filipino high school students were exposed to structured ICT modules, their digital skill levels improved significantly. This mirrors the effect of Project TechMATES, where the average scores increased by more than 4 points in every skill area.

Similarly, UNESCO (2018) emphasized that students require more than access to technology—they need structured learning experiences that allow them to explore, apply, and reflect on their digital skills. The narrowed standard deviations (SD) in the post-test suggest that students not only improved but also became more consistent in their ICT performance.

Kong et al. (2014) suggested that project-based ICT instruction leads to higher engagement, collaboration, and retention of digital skills. Project TechMATES, judging by the name and design, likely involved project-based and hands-on learning, which can explain the uniform improvement in competencies like Microsoft Excel (from 3.27 to 8.37) and PowerPoint (from 3.75 to 8.35)—skills that often require practice to master.

Ng (2012) asserts that digital literacy encompasses more than just computer basics; it also involves the ability to use word processors, spreadsheets, and presentation software effectively and critically. Table 2's increase in Word Processing scores (from 3.68 to 8.36) shows that, with the correct instruction, students can quickly become proficient.

In conclusion, the significant increase in post-test scores across all ICT skill areas validates the effectiveness of Project TechMATES in enhancing digital literacy among respondents. This improvement highlights the importance of implementing targeted ICT training programs to equip learners with essential digital competencies needed in academic and professional settings

Table 3. Significant difference in the mean pretest and posttest of the respondent before and after the implementation of Project TechMATES

ICT Skills	Pre-Test		Post-Test		t-value	Df	Mean difference	p-value
	Mean	SD	Mean	SD				
Basic Operation	5.08	1.59	3.75	1.40	-14.4	74	-3.16	< .001
Word Processing	8.24	0.80	8.35	0.67	-23	74	-4.68	< .001
Microsoft Excel	3.68	1.56	4.19	1.78	-25.1	74	-5.11	< .001
Microsoft Powerpoint	8.36	0.78	8.21	0.83	-26.1	74	-4.6	< .001
Internet Use	3.27	1.62	4.22	1.97	-17.1	74	-4.03	< .001
Basic Troubleshooting	8.37	0.61	8.49	0.97	-15.4	73	-4.27	< .001

*Correlation is significant at the 0.05 level (2-tailed).

The table shows the ICT skills before and after Project TechMATES was implemented, along with the corresponding t-values, degrees of freedom (df), mean differences, and p-values for each skill. Additionally displayed are the pre-test and post-test mean and standard deviation (SD) values. With all p-values below.001, every category exhibit incredibly significant improvement in ICT skills.

For basic operations, the mean decreased from 5.08 (SD = 1.59) in the pre-test to 3.75 (SD = 1.40) in the post-test, with a t-value of -14.4 and a mean difference of -3.16. Similarly, word processing showed an increase in mean from 8.24 to 8.35, though the change is small but statistically significant (t = -23, mean difference = -4.68). In Microsoft Excel, the mean score increased from 3.68 to 4.19 (t = -25.1), indicating notable improvement in proficiency.

PowerPoint scores remained stable, with a slight decrease in mean from 8.36 to 8.21 but with significant statistical difference (t = -26.1). Internet use scores show a remarkable improvement, as the mean increased from 3.27 to 4.22 (t = -17.1, mean difference = -4.03). Basic troubleshooting skills also improved, with the mean increasing from 8.37 to 8.49, supported by a significant t-value of -15.4.

The consistent significant differences in pre- and post-test scores suggest that Project TechMATES effectively enhanced participants' ICT skills. This aligns with studies emphasizing the importance of structured training programs in improving digital literacy and technical skills. For instance, research by Xie et al. (2020) highlighted how focused interventions significantly improve participants' confidence and performance in ICT tasks. Additionally, the observed improvements reflect findings by Kumar and Kumar (2019), who underscored the role of targeted skill enhancement initiatives in bridging digital competency gaps among learners and professionals

In particular, the notable improvement in Microsoft Excel (Mean Difference = -5.11, $p < .001$) and Internet Use (Mean Difference = -4.03, $p < .001$) aligns with previous findings by Alenezi (2018), who demonstrated that structured ICT workshops significantly enhance learners' skills in spreadsheet manipulation and online research. Similarly, the increased competence in Basic Troubleshooting mirrors the outcomes of a study by Zhang et al. (2020), which emphasized the role of guided practice and peer support in building technical problem-solving abilities.

Moreover, the significant changes in Word Processing and Microsoft PowerPoint skills also reflect the results of a quasi-experimental study by Santos (2017), who noted that students exposed to blended learning environments demonstrated higher retention and application of software-related skills compared to those in traditional classrooms.

The consistent improvement across all assessed skills areas, as shown by the t-values and corresponding p-values (all < .001), supports the hypothesis that Project TechMATES had a meaningful impact. These findings resonate with the work of UNESCO (2013), which advocates for targeted ICT interventions to foster 21st-century skills in developing educational settings.

5. CONCLUSION

Project TechMATES significantly improved the respondents' ICT competencies; post-test results showed remarkable gains in all skill areas. The significant increase in mean scores and the statistically significant differences between the pre-test and post-test results show how effectively organized digital literacy training closes skill gaps. These results demonstrate the need for continuous ICT instruction to give students the foundational technological skills needed for both academic success and future career readiness.

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