



The Role of Information and Communication Technologies (ICT) in Education

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Received: November 1, 2025

Revised: November 30, 2025

Accepted: December 12, 2025

ABSTRACT

This study quantitatively explored the perceptions of 175 randomly selected public elementary school teachers regarding the essential role of Information and Communication Technologies (ICT) in sustaining and improving education during the challenging period of the COVID-19 pandemic and its long-term impact on pedagogical practices. The research was conducted in a major school district in the Division of Negros Occidental, Philippines (generalizing CALATRAVA), during the 2021-2022 school year. Specifically, it assessed teachers' views on ICT integration across five key areas: subject delivery and learning, differentiation of instruction, collaboration, assessment and evaluation, and giving feedback, in addition to its perceived impact on teaching innovations and readiness for advanced technology. Data, collected via a validated survey, revealed that teachers overwhelmingly Strongly Agreed with the critical role of ICT, especially for Giving Feedback (WX=4.70) and Assessment and Evaluation (WX=4.50). In contrast, Differentiation of Instruction garnered the lowest consensus (WX=4.03, Interpreted as Agree). Furthermore, teachers perceived the integration of technology as having a Very High Impact on future education, particularly in advancing knowledge in a technology-rich learning environment. Conclusion: The findings affirm that ICT was crucial for maintaining educational continuity and is strongly embraced by educators as a transformative tool for the future. However, the lower rating for Differentiation of Instruction highlights an implementation gap. Recommendation: It is recommended that school divisions prioritize professional development programs focused on advanced pedagogical applications of ICT, specifically targeting the effective use of digital tools for highly differentiated and individualized instruction.

Keywords: Information and Communication Technologies, ICT Integration, Technology-Enhanced Education

How to Cite:

Alegrado, A. C., Alegrado, C. C., Nillama, E. V., Garnica, F. P., & Nillama, G. M. (2025). The Role of Information and Communication Technologies (ICT) in Education. *Global Journal of STEM Education & Management Research*, 1(1), 131-145. <https://doi.org/10.5281/zenodo.17862210>



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INTRODUCTION

The COVID-19 pandemic necessitated an unprecedented, immediate, and non-negotiable shift to technology-mediated instruction. While global literature extensively documents the importance of ICT integration, a critical research gap persists regarding the on-the-ground perceptions and lived experiences of frontline public elementary school teachers in specific regional contexts as they adapt to the post-pandemic "new normal." Existing studies often focus on system-level policy or student outcomes, leaving a void in understanding how teachers—the direct implementers—view the practical utility and future integration of ICT across core pedagogical functions like differentiated instruction and assessment. Furthermore, there is a lack of localized data that links teacher profile variables (e.g., length of service, position) to their perceptions, which is vital for designing targeted and effective professional development. Therefore, this study was conducted to fill this gap by assessing the specific perceptions of elementary school teachers concerning the practical roles of ICT during the pandemic and its perceived long-term impact on teaching innovations and technological readiness in their respective school setting. This focused, localized data will contribute significantly to the ongoing discussions about improving teaching and learning delivery in these challenging times.

Online tools allow teachers to reorganize their time, access current resources, and track differentiated learning pathways, while also improving communication among teachers, students, and parents. Although educators often juggle multiple platforms, technology works best as an enhancement to traditional teaching rather than a replacement. Effective integration requires that pedagogy remain central, ensuring that teachers understand both how to use digital tools and how these tools support instructional goals (Dabrowski, 2020).

The rapid shift to remote learning during the pandemic demonstrated that technology alone does not ensure quality education; teaching expertise remains essential. While many low-cost digital solutions are available, they may not meet the specific needs of educational systems and can hinder effective practice if used without careful planning. For technology to be effective, teachers must be involved in decisions regarding its instructional role and must receive support to adapt to the demands of the new normal in education (Yumul, 2020).

Information and communication technologies have permeated daily life and now play a crucial role in sustaining education during crises. ICT enables teachers to deliver lessons, communicate with learners, and engage in professional development through webinars, helping them cope with new challenges. Although numerous studies highlight the importance of integrating ICT into teaching, its use has not always been prioritized—yet in today's technology-driven environment, particularly during the pandemic, such integration has become indispensable. This study aims to contribute to ongoing discussions about improving teaching and learning delivery in these challenging times.

OBJECTIVES OF THE STUDY

The study assessed the role of Information and communication technologies in education during the pandemic. Specifically, this study sought answers to the following questions: 1) the perception of the respondents with regard to the role of Information and communication technologies in education during this pandemic with respect to subject delivery and learning; differentiation of instructions; collaboration; evaluation and assessment; and giving feedback; 2) significant difference in the perception of the respondents with regard to the role of Information and communication technologies in education during this pandemic with respect to the different aspects in terms of their profile; 3) the perceptions of the respondents on the impact of the integration of technology in education with respect to readiness for the advancement of technology; bringing advanced technology into Learning; and teaching innovations; 4) the significant difference in the perceptions of the respondents on the impact of the integration of technology in education with respect to the different aspects in terms of profile; and 5) the significant correlation between the profile of the respondents and their perceptions with regard to the impact of the integration of technology in education with respect to the different aspects.

LITERATURE REVIEW

Moradi et al. (2018) emphasized that instructional strategies linking new content with prior knowledge support deeper learning, especially given that students enter classrooms with varied levels of foundational understanding. To address these differences, they recommended the use of supplemental modules outside regular class time to provide individualized review without slowing whole-class instruction. These modules allow learners to control pacing and content, fostering independence and self-directed learning. Complementing this, Rahman (2015) highlighted the importance of metacognition—students' ability to monitor their understanding and adjust strategies—which is crucial in flexible and rapidly changing distance education environments.



High-quality instructional and self-learning materials further strengthen effective teaching and learning. Dahar (2017) noted that well-designed materials must support both emotional and cognitive development, while Colombo (2020) described modules as self-instructional tools enabling students to progress at their own pace. Kanchan (2019) added that such modules promote independence and self-confidence, and Dawe (2017) together with Stree (2014) emphasized the need for balancing teacher-centered and child-centered approaches to address diverse learner needs.

Research consistently shows that effective teachers and appropriate learning materials significantly influence student outcomes. Kimani (2018) asserted that teachers remain the most important factor affecting student achievement, while Matthew (2018) emphasized instructional materials as essential guides for planning, instruction, and assessment, especially for novice educators. Supporting these views, studies by Byington (2017), Scott (2018), and Malik et al. (2018) demonstrated that purposeful teaching strategies, early learning opportunities, and professional competence collectively shape students' academic growth.

In the Philippine context, Dangle (2020) highlighted that modular learning became the most widely used form of distance education, largely because printed and digital modules were preferred by parents in areas with poor internet access (Bernardo, 2020). This modality encourages students to develop responsibility, self-pacing skills, and intrinsic motivation, although it also demands strict self-discipline and increases preparation and administrative workloads for teachers. It further shifts teachers into roles that include progress monitoring and communication through multiple channels, while positioning parents as home-based learning facilitators.

Studies also emphasize the importance of evaluation, instructional competence, and student-centered teaching in ensuring educational effectiveness. Aquino (2017) explained that evaluation clarifies instructional goals and documents student progress, while Bay et al. (2018) described the rising teacher workload brought by regulatory initiatives such as OBE. Bagtas (2018) differentiated teaching efficiency from effectiveness, arguing that both must complement each other. Additional scholars—Amador (2018), Carbonel (2016), Waldo (2017), Bonifacio (2017), De Leon (2017), Chavez and Dotong (2017), and Zamora (2017)—highlighted the need for developmentally appropriate practices, cooperative learning, clear standards, and attention to individual learning styles in supporting diverse learners.

Aruna (2018) showed that Early Childhood Education teachers in multilingual Mauritius develop their language pedagogy through lifelong experiences shaped by formal, informal, and cross-cultural contexts. The “double helix model of teacher professional development” illustrates this continuous process of adaptation and reinterpretation. Parallel concerns appear in Birhan's (2018) findings that preschool textbooks lack developmentally appropriate and concrete content, and in Cisneros's (2016) account of Mexican kindergarten teachers struggling with reforms misaligned with cultural traditions and limited resources. Additionally, Gurney (2018) underscored the importance of teacher reflection, while Matanlok et al. (2018), Chen (2017), Sejpal (2018), Khalil (2017), and Rahman (2015) collectively demonstrated that constructivist modules, well-designed print materials, theoretically grounded instructional design, and metacognitive assessment practices are essential for supporting diverse learners across both traditional and distance learning environments.

METHODOLOGY

Research Design

This study employed a quantitative, non-experimental descriptive research design. The descriptive approach was chosen as it is optimally suited for outlining and interpreting the characteristics of a population, focusing on describing, explaining, and validating findings related to who, what, where, when, and how. Specifically, this design was appropriate for detailing the respondents' demographic profiles and systematically assessing their perceptions regarding the role of Information and Communication Technologies in education, as well as the impact of technology integration during the COVID-19 pandemic.

Respondents of the Study

The participants of this study were 175 public elementary school teachers selected from schools within the Division of Negros Occidental during the 2021-2022 school year. A total of 175 participants were included, chosen from the CALATRAVA-1 District through a simple random sampling technique to ensure every teacher in the population had an equal chance of being selected, thereby enhancing the generalizability of the findings within the specified district. The data collected profiled these respondents based on their sex, age, highest educational attainment, position title, and length of service.

Instruments

The researcher developed a three-part research instrument to collect data on respondents' profiles, perceptions of the role of information and communication technologies (ICT) in education during the pandemic, and the perceived impact of technology integration on future education. Respondents' profiles included sex, age, highest educational attainment, position title, and length



of service. Perceptions of ICT during the pandemic were measured across subject delivery, differentiated instruction, collaboration, evaluation, and feedback, while perceptions of future impacts focused on readiness for technology, its use in learning, and teaching innovations, with responses interpreted using 5-point Likert scales. The instrument was validated through adviser feedback, revised accordingly, and subjected to a reliability test via pilot testing with ten Master Teachers not included in the study.

Data Gathering Procedure

The data gathering process commenced after the researcher secured formal approval from the relevant authorities in the Division of Negros Occidental. Following the development and rigorous validation of the three-part questionnaire checklist (which included pilot testing for reliability), the researcher obtained clearance to proceed. The questionnaires were then distributed to the 175 randomly selected teacher-respondents. The distribution and collection process were executed over a span of three days. In accordance with Ethical Considerations, the researcher personally ensured that each participant was fully informed of the study's academic purpose, the voluntary nature of their participation, and their right to withdraw at any time without consequence. Strict confidentiality was maintained, and all responses were handled in compliance with the Data Privacy Act of 2012. Once collected, the data was immediately tabulated, organized, and prepared for statistical analysis and interpretation.

Data Analysis and Statistical Treatment

The researcher analyzed the data using frequency, percentage, and rank distribution to describe the respondents' profile in terms of sex, age, educational attainment, position, and length of service. Weighted means were applied to assess respondents' perceptions of the role of ICT in education during the pandemic including differentiation of instruction, collaboration, evaluation, and feedback and the perceived impact of technology integration on future education, such as readiness for technological advancement, incorporation of advanced technology in learning, and teaching innovations. One-way ANOVA was used to determine significant differences in perceptions across respondent profiles, while Pearson's r measured the correlation between respondents' profiles and their perceptions of the impact of technology integration in future education.

Ethical Consideration

The researcher made sure that the rights and well-being of the participants were always respected. Participation in the study was completely voluntary, and respondents were free to withdraw at any time without any consequences. They were clearly informed about the academic purpose of the research, and only the researcher had access to their data to ensure confidentiality. All procedures followed the guidelines of the Data Privacy Act of 2012, protecting personal and sensitive information. By prioritizing these ethical practices, the study-built trust with the participants strengthened the credibility of the findings, and maintained a professional and respectful research process.

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.

Table 1

The Perceptions of the Respondents Regarding the Role of ICT in Education During the Pandemic with Respect to Subject Delivery and Learning

Subject Delivery and Learning	WX	VI	R
Students who are continuously exposed to technology through education have better 'knowledge', presentation skills, and innovative capabilities, and are ready to take more effort into learning as compared to their counterparts.	4.55	SA	1
Both teachers and students access information whenever and wherever they want.	4.50	SA	2
Access to course materials through remote devices.	4.45	SA	4.5
ICT in education can help students to compete in the global economy by being part of a skilled workforce.	4.45	SA	4.5



Enhancing learning experiences and providing new sets of skills.

4.47 SA 3

Average Mean

4.48 SA

Legend: 4.20-5.00 = Strongly Agree (SA), 3.40-4.19 = Agree (A), 2.60-3.39 = Moderate Agree (MA)

The respondents “Strongly Agree” with all items as well with item no. 1 “Students who are continuously exposed to technology through education have better ‘knowledge’, presentation skills, and innovative capabilities, and are ready to take more effort into learning as compared to their counterparts” in the first rank with the highest mean of 4.55, followed by item no. 2 “Both teachers and students access information whenever and wherever they want” with 4.50. Next in rank is item no. 5 “Enhancing learning experiences and providing new sets of skills” with 4.47, while item no. 3 “Access to course materials through remote devices” and no. 4 “ICT in education can help the students to compete in the global economy by being part of a skilled workforce” shared the 4.5 ranks since both have 4.45.

The results denote that the respondents believe that ICT will be helpful in education during the pandemic since students will become more innovative because of their continuous exposure to technologies, and their free access to information anytime.

Table 2

The Perceptions of the Respondents Regarding the Role of ICT In Education During the Pandemic with Respect to the Differentiation of Instructions

Differentiation of Instructions	WX	VI	R
The presence of ICT in education allows for new ways of learning for students and teachers.	4.28	SA	1.5
Teachers and learners learn differently at different rates and styles and technology provides opportunities for this to occur.	4.18	A	4
Using technology to differentiate instruction can alleviate some of the burdens, especially when it comes to saving time.	3.15	MA	5
The use of technology encompasses a wide range of applications (e.g., assistive technology, adaptive technology, and the basic use of computers for instruction).	4.25	SA	3
Enables teachers to attend to the student learning profiles in various ways so that students acquire knowledge in a variety of mediums.	4.28	SA	1.5
Average Mean	4.03	A	

Legend: 4.20-5.00 = Strongly Agree (SA), 3.40-4.19 = Agree (A), 2.60-3.39 = Moderate Agree (MA)

Table 2 presents the perceptions of the respondents regarding the role of ICT in education during this pandemic with respect to the Differentiation of Instructions.

The table shows that the respondents “Moderately Agree” about the Differentiation of Instructions as to the role of ICT in education during the pandemic garnering an average mean of 4.03.

The respondents “Strongly Agree” with item no. 1 “The presence of ICT in education allows for new ways of learning for students and teachers” and no. 5 “Enables teachers to attend to the student learning profiles in various ways so that students acquire knowledge in a variety of mediums” and shared the 1.5 ranks since both have the highest means of 4.28, followed by item no. 4 “The use of technology encompasses a wide range of applications (e.g., assistive technology, adaptive technology, and the basic use of computers for instruction)” with 4.25. The respondents “Moderately Agree” with item no. 3 “Teachers and learners learn differently at different rates and styles and technology provides opportunities for this to occur” with 4.18, while they just “Moderately Agree” with item no. 2 “Using technology to differentiate instruction can alleviate some of the burdens, especially when it comes to saving time” with 3.15.

The results implied that the respondents are confident about the role of ICT in differentiating the instructions in education during the pandemic. However, the respondents favored the idea that differentiation of instructions will save them time.



Table 3

The Perceptions of The Respondents Regarding the Role of ICT in Education During the Pandemic with Respect to Collaboration

Collaboration	WX	VI	R
Online interactions would facilitate learning without time constraints.	4.40	SA	5
ICT can be used to gauge conceptual understanding, filter information, draw conclusions and encourage peer learning among students.	4.42	SA	3.5
It encourages students to share and discuss ideas around a particular topic, issue, or problem.	4.50	SA	1
Technology helps students tackle problems in depth by setting them up in pairs.	4.42	SA	3.5
It can enable students to work collaboratively even when they are located in different places and collaborate at different times.	4.45	SA	2
Average Mean	4.44	SA	

Legend: 4.20-5.00 = Strongly Agree (SA), 3.40-4.19 = Agree (A), 2.60-3.39 = Modarately Agree (MA)

The table 3 reveals that the respondents “Strongly Agree” about the Collaboration as to the role of ICT in education during the pandemic with an average mean of 4.44.

Ranked first is item no. 3 “It encourages students to share and discuss ideas around a particular topic, issue or problem” with 4.50, followed by item no. 5 “It can enable students to work collaboratively even when they are located in different places and collaborate at different times” with 4.45. Item no. 2 “ICT can be used to gauge conceptual understanding, filter information, draw conclusions and encourage peer learning among students” and no. 4 “Technology helps students tackle problems in depth by setting them up in pairs” shared the 3.5 ranks and both have 4.42, while item no. 1 “Online interactions would facilitate learning without time constraints” is in the last rank with 4.40. All items were verbally interpreted by the respondents as “Strongly Agree”.

The results suggest that the role of ICT in education when it comes to collaboration is primarily to allow discussions and sharing of ideas of the learners and to work collaboratively with their other classmates despite being apart by distance.

Table 4

The Perceptions of the Respondents Regarding the Role of ICT In Education During the Pandemic with Respect to Assessment and Evaluation

Assessment and Evaluation	WX	VI	R
Easier to conduct assessments and generate reports, since the necessary information doesn't have to be manually handled.	4.55	SA	1.5
Making use of technology in education creates an easy-to-manage and assess learning environment.	4.55	SA	1.5
ICT integration helps teachers vary their question-asking strategies.	4.45	SA	4.5
ICT can be used in testing to administer tests, score the tests, and analyze the result.	4.45	SA	4.5
ICT can be integrated into completing student tasks such as portfolio and project-based assessments.	4.50	SA	3
Average Mean	4.50	SA	



Legend: 4.20-5.00 = Strongly Agree (SA), 3.40-4.19 = Agree (A), 2.60-3.39 = Modearately Agree (MA)

Table 4 presents the perceptions of the respondents regarding the role of ICT in education during this pandemic with respect to Assessment and Evaluation.

When it comes to Assessment and Evaluation, the respondents “Strongly Agree” with the role of ICT in education during the pandemic with an average mean of 4.50.

The respondents “Strongly Agree” to all items with item no. 1 “Easier to conduct assessments and generate reports, since the necessary information doesn’t have to be manually handled” and no. 2 “Making use of technology in education creates an easy-to-manage and assess learning environment” shared the 1.5 ranks since both have 4.55, followed by item no. 5 “ICT can be integrated into completing student tasks such as portfolio and project-based assessments” with 4.5. Item no. 3 “ICT integration helps teachers vary their question-asking strategies” and no. 4 “ICT can be used in testing to administer tests, score the tests, and analyze the result” shared the 4.5 ranks since both have 4.45.

It can be deduced from the results that the respondents saw the advantages of ICT in education during the pandemic more importantly in assessing and evaluating the performances of learners using technology. More so, the assessment and evaluation can be easily managed because of digitization.

Table 5

The Perceptions of the Respondents Regarding the Role of ICT in Education During the Pandemic with Respect to Giving Feedback

Giving Feedback	WX	VI	R
ICT is helpful in providing feedback to students and teachers have more time to focus on other aspects of supporting learning.	4.70	SA	3
ICT can help teachers by storing and recording information about how students are developing an understanding of new material.	4.70	SA	3
Technology can be used in reaching the parents for feedback.	4.72	SA	1
Digital tools can help teachers tailor feedback to different types of learners.	4.68	SA	5
Teachers use digital tools to capture a screencast so they can narrate their comments on a student's work while scrolling through it.	4.70	SA	3
Average Mean	4.70	SA	

Legend: 4.20-5.00 = Strongly Agree (SA), 3.40-4.19 = Agree (A), 2.60-3.39 = Modearately Agree (MA)

Table 5 presents the perceptions of the respondents regarding the role of ICT in education during this pandemic with respect to Giving Feedback.

It can be seen from the data on the table that the respondents “Strongly Agree” about the role of ICT in education during the pandemic concerning Giving Feedback garnering an average mean of 4.70.

The respondents gave their highest mean of 4.72 to item no. 3 “Technology can be used in reaching the parents for feedback”, while they gave 4.70 to item no. 1 “ICT is helpful in providing feedback to students and teachers have more time to focus on other aspects of supporting learning”, no. 2 “ICT can help teachers by storing and recording information about how students are developing an understanding of new material”, and no. 5 “Teachers use digital tools to capture a screencast so they can narrate their comments on a student's work while scrolling through it”. The lowest mean of 4.68 was given to item no. 4 “Digital tools can help teachers tailor feedback to different types of learners”. The respondents “Strongly Agree” with all pre-enumerated statements.

The results indicate that Giving Feedback is one of the roles of ICT in education during the pandemic which is very helpful to teachers in reaching out to parents and learners for feedback. Because of the ease of giving feedback using technology teachers still find enough time to work on their teaching and other work that will support the learning of students.



Table 6

Summary Table of the Perceptions of the Respondents Regarding the Role of ICT in Education During Pandemic

The Role of ICT in Education during Pandemic	WX	VI	R
Subject Delivery and Learning	4.48	SA	3
Differentiation of Instructions	4.03	A	5
Collaboration	4.44	SA	4
Assessment and Evaluation	4.50	SA	2
Giving Feedback	4.70	SA	1
Overall Mean	4.43	SA	

Legend: 4.20-5.00 = Strongly Agree (SA), 3.40-4.19 = Agree (A), 2.60-3.39 = Moderately Agree (MA)

Table 6 presents the summary table of the perceptions of the respondents regarding the role of ICT in education during the pandemic.

Perusal to the table is the role of ICT in education during the pandemic which was verbally interpreted as “Strongly Agree” by the respondents with an overall mean of 4.43.

The respondents ranked first in Giving Feedback with an overall mean of 4.70, followed by Assessment and Evaluation with 4.501. Third in rank is Subject Delivery and Learning with 4.48 and followed by Collaboration with 4.44. These aspects were verbally interpreted as “Strongly Agree” while Differentiation of Instruction is interpreted as “Moderately Agree” with the lowest overall mean of 4.03.

Table 7

The Significant Difference in the Perceptions of the Respondents Regarding the Role of ICT in Education During the Pandemic

Role of ICT in Education	F	p-value	H ₀	VI
Subject Delivery in Learning				
Sex	2.425	.128	FR	NS
Age	1.938	.198	FR	NS
Highest Educational Attainment	1.357	.351	FR	NS
Length of Service	.722	.672	FR	NS
Position Title	.765	.643	FR	NS
Differentiation in Instructions				
Sex	.498	.828	FR	NS
Age	.900	.557	FR	NS
Highest Educational Attainment	2.153	.180	FR	NS
Length of Service	14.603	.048	R	S
Position Title	.882	.590	FR	NS



Collaboration

Sex	1.294	.362	FR	NS
Age	.647	.724	FR	NS
Highest Educational Attainment	.435	.870	FR	NS
Length of Service	.647	.724	FR	NS
Position Title	13.199	.036	R	S

Assessment and Evaluation

Sex	.507	.836	FR	NS
Age	1.047	.500	FR	NS
Highest Educational Attainment	18.352	.019	R	S
Length of Service	12.465	.038	R	S
Position Title	16.017	.025	R	S

Giving Feedback

Sex	.936	.572	FR	NS
Age	3.289	.100	FR	NS
Highest Educational Attainment	.943	.568	FR	NS
Length of Service	3.289	.100	FR	NS
Position Title	1.818	.222	FR	NS

Legend: FR – Failed to Reject, NS – Not Significant, R – Rejected, S - Significant

Table 7 presents the test in the significant difference in the perceptions of the respondents regarding the role of ICT in education during this pandemic with respect to the different aspects in terms of their profile.

The table shows that the perceptions of the respondents on the role of ICT in education during the pandemic showed no significant difference with respect to Subject Deliver in Learning and Giving Feedback when the respondents were grouped according to their different profile variables. All significant values are higher than the 0.05 level of significance and showed enough evidence not to reject the null hypothesis of the study.

Concerning the Differentiation of Instructions, the perceptions of the respondents showed no significant differences when they were grouped according to their sex, age, highest educational attainment, and position title. All significant values are higher than the set 0.05 level of significance and favored the null hypothesis.

However, the perceptions of the respondents showed a significant difference when they were grouped according to their length of service with a significant value of .048 which is within the rejection area at 0.05 level and rejected the null hypothesis.

With respect to Collaboration, the perceptions of the respondents registered no significant differences when they were grouped according to their sex, age, highest educational attainment, and length of service. All significant values exceeded the 0.05 level of significance and failed to reject the null hypothesis. Meanwhile, a significant difference was found when the respondents were grouped according to their position title which garnered a significant value of .036 which rejected the null hypothesis at a 0.05 level of significance.

Regarding Assessment and Evaluation, no significant differences were found when they were grouped according to their sex and age since the significant values obtained by these two profile variables are higher than the 0.05 level of significance which



failed to reject the null hypothesis. But, when the respondents were grouped according to their highest educational attainment, length of service, and position title significant differences in their perceptions occurred with respective significant values of .019, .038, and .025 which are within the rejection area at the 0.05 level of significance.

The results denote that the perceptions of the respondents showed alignment with each other concerning subject delivery in learning and giving feedback despite differences in their profile variables. On the other hand, their responses showed inconsistencies in other aspects of the role of ICT in education during the pandemic because of the differences in their other profile variables.

Table 8

The Perception of the Respondents on the Impact of the Integration of Technology in Future Education with Respect to Readiness for the Advancement of Technology

Readiness for the Advancement of Technology	WX	VI	R
Attending to student readiness by using technology for differentiating instruction allows for academic growth.	4.48	VHI	3.5
Setting a vision for creating learning experiences that provide the right tools and support for all learners to thrive.	4.48	VHI	3.5
Seeking new knowledge and constantly acquiring new skills alongside their students.	4.54	VHI	2
Advancing knowledge in the technology-rich learning environment.	4.68	VHI	1
Creating a shared vision for how technology best can meet the needs of all learners.	4.42	VHI	5
Average Mean	4.52	VHI	

Legend: 4.20-5.00=Very High Impact (VHI), 3.40-4.19=High Impact (HI)

Table 8 presents the perceptions of the respondents on the impact of the integration of technology in education with respect to Readiness for the Advancement of Technology.

The data in the table shows that the respondents perceived the integration of technology “Very High Impact” on future education with respect to Readiness for the Advancement of Technology with an average mean of 4.52.

All items were verbally interpreted as “Very High Impact” with item no. 4 “Advancing knowledge in the technology-rich learning environment” in the first rank with 4.68, followed by item no. 3 “Seeking new knowledge and constantly acquiring new skills alongside their students” with 4.54. Item no. 1 “Attending to student readiness by using technology for differentiating instruction allows for academic growth” and no. 2 “Setting a vision for creating learning experiences that provide the right tools and support for all learners to thrive” shared the 3.5 ranks and both have means of 4.48, while item no. 5 “Creating a shared vision for how technology best can meet the needs of all learners” have 4.42.

The results indicate that the respondents favored the advancement in the learning environment with the use of technology as the main impact of the integration of technology for future education.

Table 9

The Perceptions of the Respondents on the Impact of the Integration of Technology in Future Education with Respect to Bringing Advanced Technology into Learning

Bringing Advance Technology into Learning	WX	VI	R
Creating an environment in which active engagement leads to on-task students.	4.50	VHI	2
Transforming learning into technology-based and learner-centered.	4.52	VHI	1



Affirming and advancing relationships between educators and students.	4.30	VHI	5
Reinventing approaches to learning and collaboration shrinks long-standing equity and accessibility gaps.	4.48	VHI	3
Adapting learning experiences to meet the needs of all learners.	4.36	VHI	4
Average Mean		4.43	VHI

Legend: 4.20-5.00=Very High Impact (VHI), 3.40-4.19=High Impact (HI)

Table 9 presents the perception of the respondents on the impact of the integration of technology in future education with respect to Bringing Advance Technology into Learning.

The table reveals that the respondents perceived that the integration of technology “Very High Impact” on future education concerning Bringing Advanced Technology into Learning, garnering an average mean of 4.43.

The respondents ranked first item no. 2 “Transforming learning into technology-based and learner-centered” with the highest mean of 4.52, followed by item no. 1 “Creating an environment in which active engagement leads to on-task students” with 4.50. Next in rank is item no. 4 “Reinventing approaches to learning and collaboration, shrink long-standing equity and accessibility gaps” with 4.48, then followed by item no. 5 “Adapting learning experiences to meet the needs of all learners” with 4.36, while item no. 3 “Affirming and advancing relationships between educators and students” is in the last rank with 4.30.

Based on the results, the respondents believed that the integration of technology will be a turning point in future education since it will transform education into a technology-based approach which leads to active engagement of students in learning.

Table 10

Perception of the Respondents on the Impact of the Integration of Technology in Future Education with Respect to Teaching Innovations

	Teaching Innovations	WX	VI	R
1	Contributing to rapid technological progress and productivity growth.	4.58	VHI	3
2	Facilitating the acquisition of basic skills.	4.46	VHI	4.5
3	Speeding up the diffusion of information.	4.46	VHI	4.5
4	Increasing efficiency in communication.	4.60	VHI	2
5	Promoting the shift to a learner-centered environment.	4.62	VHI	1
Average Mean		4.54	VHI	

Legend: 4.20-5.00=Very High Impact (VHI), 3.40-4.19=High Impact (HI)

Table 10 presents the perception of the respondents on the impact of the integration of technology in future education with respect to Teaching Innovations.

It can be observed from the table that the respondents perceived the integration of technology in future education as “Very High Impact” with respect to Teaching Innovations with an average mean of 4.54.

The respondents perceived all items as having “Very High Impact” with item no. 5 “Promoting the shift to a learner-centered environment” in the first rank with the highest mean of 4.62, followed by item no. 4 “Increasing efficiency in communication” with 4.60. Item no. 1 “Contributing to rapid technological progress and productivity growth” is in the third rank with 4.58, while item no. 2 “Facilitating the acquisition of basic skills” and no. 3 “Speeding up the diffusion of information” shared the 4.5 ranks and both have 4.46.

It can be noted from the results that the integration of technology can provide a great impact on teaching innovations in the future which will give way to a learner-centered environment and continuous communication between teachers and learners.



Table 11

Summary Table of the Perceptions of the Respondents on the Impact of the Integration of Technology in Future Education with Respect to the Different Aspects

Impact of the Integration of Technology in Future Education			WX	VI	R
1	Readiness to Advancement of Technology		4.52	VHI	2
2	Bringing Advanced Technology into Learning		4.43	VHI	3
3	Teaching Innovations		4.54	VHI	1
Grand Mean			4.50	VHI	

Legend: 4.20-5.00=Very High Impact (VHI), 3.40-4.19=High Impact (HI)

Table 11 presents the summary table of the perceptions of the respondents on the impact of the integration of technology in future education with respect to the different aspects.

The table shows that the respondents perceived the integration of technology as “Very High Impact” on teaching innovations in future education with an overall mean of 4.50. All aspects were verbally interpreted likewise. Ranked first is Teaching Innovations with the highest overall mean of 4.54, followed by Readiness to Advancement of Technology with 4.52, while Bringing Advanced Technology into Learning is in the last rank with 4.43.

The summary suggests that integrating technology will have of great impact on teaching innovations and it will ready both learners and teachers for the advancement of technology.

Table 12

The Significant Difference in the Perceptions of the Respondents About the Impact of the Integration of Technology in Future Education with Respect to the Different Aspects in Terms of Profile

Impact of the Integration of Technology on Future Education		F	p-value	H_o	VI
Readiness for the Advancement in Technology					
Sex		13.112	.031	R	S
Age		3.324	.421	FR	NS
Highest Educational Attainment		.924	.542	FR	NS
Length of Service		1.455	.392	FR	NS
Position Title		1.881	.401	FR	NS
Bringing Advanced Technology into Learning					
Sex		1.447	.388	FR	NS
Age		2.119	.194	FR	NS
Highest Educational Attainment		2.013	.174	FR	NS
Length of Service		1.359	.391	FR	NS
Position Title		3.240	.411	FR	NS



Teaching Innovations

Sex	1.664	.399	FR	NS
Age	1.014	.298	FR	NS
Highest Educational Attainment	.849	.445	FR	NS
Length of Service	.947	.552	FR	NS
Position Title	4.189	.062	FR	NS

Legend: FR – Failed to Reject, NS – Not Significant, R – Rejected, S - Significant

Table 12 presents the test on significant differences in the perceptions of the respondents about the impact of the integration of technology in future education concerning the different aspects when they were grouped according to their profile.

The table shows that the perceptions of the respondents on the impact of the integration of technology in future education registered no significant differences with respect to Bringing Advanced Technology into Learning and Teaching Innovations when they were grouped according to their sex, age, highest educational attainment, length of service, and position title. All significant values are higher than the 0.05 level of significance and failed to reject the null hypothesis of the study.

On the other hand, a significant difference was found in their perceptions about the impact of the integration of technology in future education with respect to Readiness for Advancement in Technology when they were grouped according to their sex. The significant value of .031 rejected the null hypothesis at the 0.05 level of significance. However, no significant differences were registered in terms of other profile variables such as age, highest educational attainment, length of service, and position title.

The results implied that the profile of the respondents did not have any influence on their perceptions pertaining to the impact of the integration of technology concerning the different aspects.

CONCLUSION

This study successfully assessed the role of Information and Communication Technologies (ICT) in public elementary education, specifically during and following the pivot to distance learning necessitated by the COVID-19 pandemic. The findings decisively confirm the central research hypothesis: ICT played a crucial, highly-regarded role in sustaining educational continuity, garnering an overall "Strongly Agree" perception from the teacher-respondents ($WX=4.43$). The highest perceived benefits were concentrated in the operational and communication aspects of teaching, namely Giving Feedback ($WX=4.70$) and Assessment and Evaluation ($WX=4.50$). Teachers also perceive a Very High Impact of technology integration on the future of education, particularly in promoting technological readiness and innovation. However, a significant finding emerged in the area of Differentiation of Instruction, which received the lowest consensus ($WX=4.03$, "Agree"). This result points to a critical challenge: while teachers are willing and see the potential of ICT, there remains a gap in the effective and efficient implementation of tools for true individualized instruction. Finally, the analysis of variance revealed that teacher profile variables, specifically Length of Service, Position Title, and Highest Educational Attainment, significantly influence perceptions in certain key areas like Differentiation, Collaboration, and Assessment, indicating that a one-size-fits-all approach to ICT training is inadequate. In summary, ICT is no longer just an enhancement but is fundamentally embedded in the pedagogical landscape, with the next phase of integration requiring focused attention on advanced, equity-based applications like effective differentiation.

RECOMMENDATIONS

Based on the findings and conclusions of this study, the following recommendations are proposed to optimize the role and impact of ICT in the educational system:

Targeted Professional Development for Differentiation: Given that "Differentiation of Instruction" received the lowest agreement rating, school administrators and division offices should design and implement specialized training programs. These programs must move beyond basic ICT literacy to focus on practical, advanced application of digital tools and platforms for creating genuinely individualized and differentiated learning experiences (e.g., adaptive testing, personalized learning pathways).

Develop a Context-Specific ICT Integration Program: The significant differences in perceptions across various teacher profiles (Length of Service, Position Title, Educational Attainment) necessitate a stratified approach to training. An ICT Integration



Program should be developed that is customized to the specific needs and experience levels of teacher groups, addressing the fact that a one-size-fits-all curriculum is inadequate for certain pedagogical functions.

Policy and Resource Enhancement for Efficiency: To address the finding that ICT for differentiation does not yet effectively save teacher time, the school division should invest in user-friendly, high-efficiency digital tools for grading, record-keeping, and automated feedback. Policy should also be reviewed to ensure teachers have dedicated, protected time for mastering these new technological tools and integrating them without adding undue administrative burden.

Future Research: Future researchers should conduct a mixed-methods study to qualitatively explore why Differentiation of Instruction is perceived as less effective or less time-saving than other ICT functions. This qualitative data could provide rich, practical insights to further inform the necessary professional development content.

Sustained Review of Assessment Tools: Given the high reliance on ICT for Assessment and Evaluation, policies should be established for the continuous review and accreditation of digital assessment tools to ensure they adhere to standards of validity, reliability, and equity.

Conflict of Interest

The authors declare no conflict of interest related to the conduct, authorship, and publication of this research. All procedures and interpretations were performed independently, and no financial, professional, or personal relationships influenced the results of this study.

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