

## The Information and Communication Technology (ICT) Integration Practices in Teaching Home Economics in Grade 4 in the Public Elementary Schools in Jose Panganiban East and West Districts, Division of Camarines Norte

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### ABSTRACT

This study examined the Information and Communication Technology (ICT) integration practices in teaching Home Economics in Grade 4 in public elementary schools in Jose Panganiban East and West Districts, Division of Camarines Norte, during School Year 2024-2025. The inquiry responds to the continuing demand for technology-enabled instruction that can strengthen motivation, content delivery, learner interaction, and assessment in skill-oriented elementary subjects. Home Economics requires demonstrations, guided practice, and performance evaluation; therefore, ICT has the potential to make concepts more visible, interactive, and measurable. The study also recognized that strong integration may coexist with practical constraints such as weak connectivity, insufficient devices, limited teacher training, and inadequate professional networks. The study focused on two major areas: the level of ICT integration practices and the challenges encountered by teachers in implementing such practices. ICT integration was examined along four instructional stages: motivation, presentation, discussion, and assessment. Teacher challenges were examined along internet connectivity, availability of gadgets, knowledge of ICT utilization and application, and networking. The study further tested whether the rank orders of these practices and challenges differed significantly between the two respondent groups. A descriptive-evaluative-inferential design was employed to generate a data-grounded account of ICT practices and to test differences in rank orders across respondent groups. Purposive sampling was used in selecting Jose Panganiban East and West Districts, while total enumeration was applied to the 52 Grade 4 teachers who served as respondents. The study used a structured researcher-made questionnaire with scaled responses. The data were analyzed through weighted mean, ranking, and the Wilcoxon Mann-Whitney U test at the 0.05 level of significance. Findings revealed that ICT integration practices in Home Economics were very much evident across all four instructional areas. Presentation, discussion, and assessment each obtained a mean of 4.89, while motivation obtained a mean of 4.85. The overall mean of 4.88 indicates that teachers routinely integrated digital tools into lesson preparation, classroom interaction, and learner evaluation. These results suggest a strong instructional shift from purely conventional Home Economics teaching toward technology-supported and learner-centered instruction. The item-level findings showed that teachers used multimedia presentations, virtual tours, motivational videos, infographics, online polls, and digital brainstorming tools to motivate learners. During presentation, teachers used digital whiteboards, screen recordings, multimedia presentations, virtual guest speakers, video demonstrations, and virtual laboratories to make concepts clearer. During discussion, learners participated through digital platforms, blogs, vlogs, online forums, social media groups, real-time quizzes, virtual debates, and collaborative documents. During assessment, Google Forms, e-portfolios, digital presentations, video submissions, online quizzes, rubrics for digital projects, and AI-supported tools were used to document learner performance. The significance test on ICT integration practices indicated no significant difference in the rank orders of motivation, presentation, discussion, and assessment. The computed z-values and probabilities were -0.17 and 0.4325 for motivation, -0.05 and 0.4801 for presentation, -0.20 and 0.4207 for discussion, and -0.94 and 0.1736 for assessment. Since all probability values were greater than 0.05, the null hypothesis was accepted. This finding indicates that ICT integration practices were generally consistent across the two respondent groups. Despite the very high level of ICT

integration, teachers reported that ICT-related challenges were very much challenging overall. Availability of gadgets ranked highest with a mean of 4.91, followed by knowledge of ICT utilization and application and networking, both with a mean of 4.88. Internet connectivity obtained a mean of 4.78, which was also interpreted as very much challenging. These results indicate that the sustainability of ICT integration depends not only on teacher willingness but also on infrastructure, equipment, technical competence, and professional support systems. The challenge indicators revealed specific barriers that must be addressed through institutional policy. Teachers reported unstable connections, delayed online assessments, difficulty updating digital resources, and reliance on offline alternatives due to unreliable connectivity. They also reported insufficient computer laboratories, outdated computers, shared teacher devices, limited projectors and smart boards, and learners' lack of personal devices. In addition, teachers faced difficulty integrating ICT into lesson planning, troubleshooting technical issues, selecting suitable digital resources, and accessing professional learning communities and ICT partnerships. The significance test on ICT-related challenges showed that only internet connectivity differed significantly between the respondent groups. Internet connectivity obtained a z-value of -1.72 and probability of 0.0427, resulting in rejection of the null hypothesis for this area. Availability of gadgets, knowledge of ICT utilization and application, and networking were not significantly different, as their probabilities were greater than 0.05. This pattern suggests that connectivity conditions may vary more sharply across district contexts than device access, teacher competence, or professional networking constraints. The study concludes that Grade 4 Home Economics teachers demonstrate very high ICT integration practices but remain constrained by serious digital access, infrastructure, and capability issues. The findings imply that schools and education authorities should sustain teacher training, improve internet infrastructure, expand device availability, strengthen ICT mentoring, and develop contextualized e-learning resources for Home Economics. The study recommends the adoption of ICT integration benchmarks, periodic monitoring, and partnerships among schools, DepEd, local government units, DICT, and teacher education institutions.

## 1. Introduction

Education systems across the world are increasingly shaped by the integration of digital technologies into teaching and learning. The expansion of ICT in schools has altered how teachers motivate learners, present lessons, facilitate interaction, and assess learning outcomes. In elementary education, ICT is no longer limited to computer literacy but is now embedded in the instructional process itself. This shift is especially important in skill-based subjects where learners benefit from demonstration, visualization, practice, and immediate feedback.

The rise of 21st-century education has placed strong emphasis on digital literacy, collaboration, creativity, communication, and problem solving. These competencies require learning environments that are interactive, multimodal, and responsive to learner needs. ICT integration provides teachers with tools to create such environments through videos, simulations, digital quizzes, online collaboration, and multimedia presentations. When used appropriately, technology enables learners to connect abstract ideas to practical experiences and real-world contexts.

Home Economics is an instructional area that benefits substantially from ICT-supported pedagogy. Its content often involves practical tasks, household management concepts, livelihood skills, food preparation, clothing care, consumer education, and other life-oriented competencies. Many of these topics are better understood when learners can see demonstrations, observe procedures, compare examples, and receive visual guidance. ICT tools allow teachers to present these processes more clearly and repeatedly than purely oral or textbook-based instruction.

In Grade 4, learners are at a developmental stage where visual, interactive, and experiential learning is particularly meaningful. They are beginning to acquire more complex skills while still needing concrete examples, guided practice, and structured reinforcement. ICT can support this developmental need by providing animated explanations, virtual demonstrations, simulations, and digital practice activities. It can also increase learner confidence because students may revisit digital materials and participate through varied modalities.

Motivation is one of the earliest points at which ICT can influence learning. Multimedia presentations, short videos, digital games, online polls, and virtual tours can stimulate curiosity before formal instruction begins. In Home Economics, such motivational tools can connect learners to real-life occupations, household practices, community resources, and practical applications. When learners see the relevance of the lesson through technology, they are more likely to engage actively with the learning tasks that follow.

ICT also enhances lesson presentation by giving teachers flexible and visually enriched ways to organize content. PowerPoint, Prezi, digital whiteboards, smart boards, screen recordings, video demonstrations, and virtual guest speakers can make teaching more structured and engaging. These tools are especially useful when lessons require sequencing, procedure demonstration, comparison, or visual illustration. In this sense, ICT strengthens the teacher's capacity to translate content into accessible learning experiences.

Discussion is another instructional stage where ICT offers significant pedagogical value. Digital platforms, online forums, collaborative documents, blogs, vlogs, social media groups, webinars, and video conferencing create opportunities for learners to express ideas beyond traditional recitation. These tools can support peer interaction, reflective thinking, and collaborative problem solving. In Home Economics, discussion through ICT can help learners analyze home, family, consumer, and livelihood issues in ways that are participatory and current.

Assessment has likewise been transformed by digital technologies. Traditional paper-and-pencil tests can now be supplemented or replaced by Google Forms, e-portfolios, digital presentations, online quizzes, video submissions, interactive simulations, and digital rubrics. These tools allow teachers to gather evidence of learning more efficiently and to evaluate both knowledge and practical skills. Digital assessment also supports faster feedback, learner reflection, and progress monitoring.

However, effective ICT integration does not occur automatically. Teachers must possess knowledge of digital tools, pedagogical judgment, technical troubleshooting skills, and the ability to align technology with learning objectives. Without adequate preparation, ICT may become a superficial add-on rather than a meaningful instructional support. The challenge is therefore not only access to technology but also the capacity to use technology purposefully in the teaching-learning process.

Infrastructure remains one of the most persistent barriers to ICT integration in public schools. Slow or unstable internet connections can disrupt online discussions, delay assessments, interrupt virtual meetings, and limit access to cloud-based resources. In subjects requiring demonstrations and simulations, poor connectivity can reduce the effectiveness of video streaming or virtual laboratories. Such limitations may force teachers to revert to offline or conventional methods even when digital strategies are planned.

Device availability is another critical factor. ICT integration requires computers, tablets, smartphones, projectors, smart boards, and other digital tools, yet schools and learners may not have sufficient access to them. Teachers may share devices, prepare lessons using outdated equipment, or teach learners who cannot complete digital assignments because they lack personal gadgets. These conditions create inequities in access and affect the consistency of technology-supported learning.

Teacher knowledge of ICT utilization and application is also central to successful integration. Teachers may be willing to adopt technology but may still struggle with lesson planning, multimedia creation, troubleshooting, online assessment tools, collaborative platforms, and adaptation of ICT to diverse learning styles. Fear of technology can also discourage experimentation and innovation. Ongoing professional development is therefore necessary to convert access into confident and effective practice.

Networking and professional support systems further influence ICT integration. Teachers need opportunities to collaborate with ICT-skilled colleagues, technology experts, professional learning communities, parents, community partners, and other institutions. Such networks provide technical assistance, resource sharing, mentorship, and exposure to emerging practices. Weak networking limits teachers' ability to sustain innovation and solve recurring ICT-related problems.

In the Philippine public school context, ICT integration is linked to broader goals of quality, inclusive, and future-ready education. Public schools are expected to prepare learners for a digital society while also addressing unequal access to technology. This responsibility is complex because teachers must integrate ICT while navigating resource constraints and varied learner contexts. Empirical studies at the district level are therefore important because they reveal how policy aspirations are experienced in actual classrooms.

Jose Panganiban East and West Districts provide a relevant context for examining ICT integration in Grade 4 Home Economics. These districts represent public elementary school settings where teachers are expected to employ digital tools while responding to local conditions. The experiences of teachers in these districts can inform more realistic policy recommendations for infrastructure, teacher training, device provision, and monitoring. Their responses provide evidence on both the level of practice and the barriers that shape implementation.

This study therefore examined ICT integration practices in teaching Home Economics in Grade 4 in the public elementary schools of Jose Panganiban East and West Districts, Division of Camarines Norte. Specifically, it assessed ICT practices along motivation, presentation, discussion, and assessment; tested significant differences in the rank orders of these practices; identified challenges along connectivity, gadgets, ICT knowledge, and networking; tested differences in these challenges; and formulated policy recommendations. The article converts the thesis findings into an IMRAD manuscript suitable for scholarly dissemination. It emphasizes not only the high level of ICT practice but also the structural and professional conditions needed to sustain it.

## 2. Methodology

This study employed a descriptive-evaluative-inferential research design to examine ICT integration practices in teaching Grade 4 Home Economics. The descriptive component was used to determine the extent to which ICT practices were evident across the instructional phases of motivation, presentation, discussion, and assessment. The evaluative component was used to interpret the degree of practice and challenge based on weighted means and verbal descriptions. The inferential component was used to test whether the rank orders of responses differed significantly between the two groups of respondents.

The study was conducted in the public elementary schools of Jose Panganiban East and West Districts, Division of Camarines Norte, during School Year 2024-2025. These two districts were selected because they provided the appropriate educational setting for examining ICT integration in Grade 4 Home Economics. The locale allowed the study to capture data from teachers working within comparable curricular expectations but potentially different resource and connectivity contexts. This made the districts suitable for comparing perceived practices and challenges.

The respondents consisted of 52 Grade 4 teachers from the selected public elementary schools. Purposive sampling was used in choosing Jose Panganiban East and West Districts because the study focused specifically on their implementation contexts. Total enumeration was then used in identifying the teacher-respondents, ensuring that all available Grade 4 teachers within the defined population were included. This approach strengthened the representativeness of the data within the selected districts.

The main research instrument was a structured questionnaire designed to measure two broad areas: ICT integration practices and ICT-related challenges. The first part measured the extent of ICT integration in teaching Home Economics along motivation, presentation, discussion, and assessment. The second part measured challenges encountered by teachers along internet connectivity, availability of gadgets, knowledge of ICT utilization and application, and networking. The structure of the instrument allowed the study to capture both enabling practices and constraining conditions.

The questionnaire used a five-point scale appropriate to each construct. For ICT integration practices, the interpretation ranged from not at all to very much evident. For challenges, the interpretation ranged from not at all to very much challenging. Weighted means were computed for each indicator and each major domain. The use of weighted means enabled the researcher to identify the relative strength of practices and severity of challenges.

The instrument was based on the research problems and the instructional realities of teaching Home Economics with ICT. Items reflected common technology-supported strategies such as multimedia presentations, online polls, virtual laboratories, collaborative digital documents, e-portfolios, and online assessment tools. Challenge items reflected common barriers such as unstable internet, lack of gadgets, inadequate training, difficulty troubleshooting, and weak professional networking. This alignment ensured that the instrument captured the major dimensions of ICT integration relevant to the study.

Data gathering followed the standard procedure of securing permission, administering the questionnaire, retrieving responses, tabulating results, and subjecting the data to statistical treatment. Respondents were expected to answer based on their actual teaching experiences in Grade 4 Home Economics. The study treated the responses with confidentiality and used the data only for research purposes. This procedure supported ethical and orderly collection of evidence from teacher-respondents.

The statistical tools used were weighted mean, rank, and the Wilcoxon Mann-Whitney U test. Weighted mean was used to describe the level of practice or challenge per indicator and per domain. Ranking was used to identify the relative order of indicators and domains. The Wilcoxon Mann-Whitney U test was used to determine whether the rank orders differed significantly between the two groups of respondents at the 0.05 level of significance.

The decision rule was based on the probability associated with the computed z-value. When the probability value was greater than 0.05, the null hypothesis was accepted, indicating no significant difference in rank orders. When the probability value was less than 0.05, the null hypothesis was rejected, indicating a significant difference. This analytic approach was appropriate because the data were ordinal in nature and were compared across two independent respondent groups.

**3. Results and Discussions**

This section presents the empirical findings on ICT integration practices and the challenges encountered by Grade 4 Home Economics teachers. The discussion begins with the instructional domains of motivation, presentation, discussion, and assessment, followed by the summary and significance test for ICT integration practices. It then proceeds to the challenge domains of internet connectivity, availability of gadgets, knowledge of ICT utilization and application, and networking, followed by the challenge summary and significance test. Each table is followed by an analytical discussion to interpret the statistical results in relation to instructional practice and policy implications.

Table 1. ICT Integration Practices along Motivation

Indicator	Average Mean	Interpretation	Rank
Teachers use multimedia presentations to capture learners' interest.	5.00	VME	3
ICT-based games and quizzes engage learners before the lesson.	4.79	VME	8.5
Online simulations are used to demonstrate real-world applications.	4.79	VME	8.5
Interactive videos enhance curiosity and excitement.	4.75	VME	10
Virtual tours of industries related to Home Economics are introduced.	5.00	VME	3
Digital storytelling is used to introduce topics.	4.84	VME	7
Teachers utilize online polls and surveys for learner engagement.	4.87	VME	6
Motivational videos on career opportunities in Home Economics are presented.	5.00	VME	3
Augmented reality tools bring topics to life.	4.57	VME	12
Infographics and digital posters summarize key concepts attractively.	5.00	VME	3
Learners are encouraged to explore topics through web-based research.	4.61	VME	11
Digital brainstorming tools facilitate interactive idea sharing.	5.00	VME	3
Average	4.85	VME	

The motivation results show a very high level of ICT integration, with an average mean of 4.85 interpreted as very much evident. The indicators with perfect mean scores include multimedia presentations, virtual tours, career-oriented motivational videos, infographics and digital posters, and digital brainstorming tools. This pattern shows that teachers use ICT not only to attract attention but also to connect Home Economics content to future work, practical skills, and real-world settings. Motivation in this context becomes experiential and visually grounded rather than limited to verbal introductory activities.

The high ratings for online polls, digital storytelling, ICT-based games, simulations, and interactive videos indicate that teachers employ multiple digital entry points for learner engagement. These tools support different learning preferences because some

learners respond better to images, narratives, exploration, competition, or quick feedback. The strong use of digital motivation also suggests that teachers recognize the importance of emotional readiness before skill acquisition. In Home Economics, this is especially important because learners must see practical relevance before they can value the lesson.

The relatively lower but still very much evident scores for web-based research and augmented reality indicate areas where further enrichment is possible. These tools require stronger connectivity, better devices, and higher teacher confidence, which may explain why they ranked lower than more familiar multimedia resources. Nevertheless, their ratings remained high, suggesting openness to more advanced and exploratory technologies. Future capacity-building may focus on helping teachers design safe, age-appropriate, and curriculum-aligned web and AR activities.

Overall, the motivation findings imply that teachers are using ICT as a gateway to learner interest and participation. The challenge for schools is to sustain this practice by ensuring access to multimedia equipment, curated digital resources, and teacher training. Strong motivation through ICT can improve lesson entry, but it must be followed by equally strong presentation, discussion, and assessment. The next table therefore examines how ICT is used during formal lesson delivery.

**Table 2. ICT Integration Practices along Presentation**

Indicator	Average Mean	Interpretation	Rank
Teachers use PowerPoint or Prezi for structured lesson delivery.	4.93	VME	6
Video demonstrations explain complex Home Economics skills.	4.93	VME	6
Digital whiteboards and smart boards make lessons more interactive.	5.00	VME	2.5
Infographics present key concepts in a visually appealing way.	4.78	VME	11
Virtual labs simulate hands-on Home Economics activities.	4.93	VME	6
Online articles and e-books supplement discussions.	4.89	VME	8
AI-powered tools assist in presenting real-time data and trends.	4.73	VME	13
Teachers use screen recording tools to prepare tutorials.	5.00	VME	2.5
Learners engage with multimedia presentations for deeper understanding.	5.00	VME	2.5
Gamification techniques like Kahoot! and Quizizz make presentations interactive.	4.75	VME	12
Cloud-based presentations enable collaboration.	4.87	VME	9
Augmented reality enhances content visualization.	4.78	VME	10
Virtual guest speakers provide industry insights.	5.00	VME	2.5
Average	4.89	VME	

The presentation results yielded an average mean of 4.89, interpreted as very much evident. Digital whiteboards, screen recording tools, multimedia presentations, and virtual guest speakers obtained perfect mean scores. These results indicate that teachers are highly active in using ICT to organize, demonstrate, and enrich Home Economics lessons. Such tools are particularly useful because Home Economics often requires visual sequencing, procedural explanation, and repeated demonstration.

The high ratings for PowerPoint or Prezi, video demonstrations, virtual laboratories, online articles, e-books, and cloud-based presentations show that teachers use a broad range of digital materials. Video demonstrations and virtual laboratories can simulate hands-on skills when physical resources are limited or when safety and time constraints exist. Online articles and e-books extend the lesson beyond the textbook and allow teachers to provide updated examples. Cloud-based presentations also introduce collaboration and flexibility in lesson development.

Augmented reality, gamification, and AI-powered tools also received very high ratings, although slightly lower than the most familiar tools. This suggests that while teachers are already integrating emerging technologies, their use may still be developing compared with established presentation tools. These technologies can make Home Economics instruction more interactive by allowing learners to visualize materials, procedures, or trends. However, they require stronger technical support, stable internet, and additional teacher training.

The findings imply that presentation is one of the strongest ICT integration areas in the study. Teachers appear to understand that well-designed digital presentation improves clarity and learner comprehension. For policy and supervision, this means that schools should not only provide presentation devices but also encourage quality standards for digital lesson materials. Presentation effectiveness depends on both the availability of tools and the pedagogical skill with which teachers use them.

**Table 3. ICT Integration Practices along Discussion**

Indicator	Average Mean	Interpretation	Rank
Online discussion forums encourage collaborative learning.	4.93	VME	5.5
Teachers use video conferencing for remote interaction.	4.84	VME	9
Learners engage in peer discussions through digital platforms.	5.00	VME	2.5
Online surveys and polls gather real-time opinions.	5.00	VME	2.5
Interactive presentations allow learners to ask questions instantly.	4.93	VME	5.5

Indicator	Average Mean	Interpretation	Rank
Virtual debates on Home Economics issues encourage critical thinking.	4.83	VME	10
Social media groups foster subject-related discussions.	4.90	VME	7
Teachers use collaborative digital documents for brainstorming.	5.00	VME	2.5
Webinars and online workshops enhance discussions.	4.64	VME	12
Teachers utilize real-time quizzes to gauge learners' understanding.	4.87	VME	8
Podcasts and expert interviews are used for deeper insights.	4.77	VME	11
Learners contribute to class discussions using blogs and vlogs	5.00	VME	2.5
Average	4.89	VME	

The discussion component also obtained an average mean of 4.89, interpreted as very much evident. Perfect mean scores were recorded for peer discussions through digital platforms, online surveys and polls, collaborative digital documents, and learner contributions through blogs and vlogs. These results show that ICT is being used to make classroom communication more participatory and learner-centered. Discussion is no longer confined to oral recitation but is extended into digital spaces where learners can write, post, collaborate, and reflect.

The high ratings for online forums, interactive presentations, social media groups, real-time quizzes, video conferencing, virtual debates, podcasts, expert interviews, webinars, and workshops indicate diverse discussion modes. Such variety is important because Home Economics requires both conceptual discussion and practical judgment. Learners can debate household issues, analyze consumer choices, discuss safety practices, and share reflections through different digital channels. ICT therefore expands both the space and form of classroom discourse.

The lower ranking of webinars and online workshops, although still very much evident, suggests that externally mediated discussion opportunities may be less frequent than classroom-based digital tools. This may be due to scheduling, connectivity, availability of resource persons, or administrative support. Podcasts and expert interviews also ranked lower than peer platforms and digital documents, suggesting a need to strengthen exposure to expert voices. These tools can deepen learner understanding when systematically integrated into lesson plans.

The discussion findings imply that ICT integration supports collaborative, reflective, and interactive learning in Home Economics. Teachers are already using tools that encourage learners to participate actively and share ideas. To strengthen this area, schools may develop guidelines on safe, ethical, and purposeful online discussion. Digital discussion must be moderated carefully so that it remains academically meaningful and appropriate to Grade 4 learners.

Table 4. ICT Integration Practices along Assessment

Indicator	Average Mean	Interpretation	Rank
Online quizzes assess knowledge retention.	4.77	VME	10
Teachers use Google Forms for formative assessments.	5.00	VME	2
Learners create digital presentations as an alternative to traditional tests.	5.00	VME	2
Video submissions evaluate practical skills.	4.84	VME	6.5
E-portfolios track learners' progress.	5.00	VME	2
Teachers provide instant feedback through digital tools.	4.80	VME	9
AI-driven assessment tools analyze learning patterns.	4.85	VME	5
Rubrics for digital projects ensure clear evaluation criteria.	4.83	VME	8
Interactive simulations assess practical applications.	4.84	VME	6.5
Self-assessment tools promote reflective learning.	4.93	VME	4
Average	4.89	VME	

The assessment component achieved an average mean of 4.89, also interpreted as very much evident. Teachers' use of Google Forms, digital presentations as alternatives to traditional tests, and e-portfolios obtained perfect mean scores. These findings show that assessment in Home Economics has moved beyond conventional tests toward more flexible and evidence-based digital formats. Digital assessment enables teachers to document both knowledge and performance outcomes.

The high ratings for self-assessment tools, AI-driven assessment tools, video submissions, interactive simulations, digital rubrics, instant feedback tools, and online quizzes indicate a rich assessment ecosystem. Video submissions are particularly relevant to Home Economics because they allow learners to demonstrate practical skills. E-portfolios and digital presentations provide cumulative evidence of learning, while self-assessment encourages reflection and accountability. These approaches align well with performance-oriented learning.

The relatively lower ranking of online quizzes does not suggest weakness but indicates that teachers may be giving stronger emphasis to authentic and performance-oriented digital assessment. This is appropriate for Home Economics because practical

competencies cannot be fully measured through recall tests alone. Digital rubrics and video-based evidence can make evaluation more transparent and meaningful. However, these tools require clear criteria, teacher consistency, and sufficient device access. The assessment findings imply that ICT integration has strengthened both formative and summative evaluation practices. Teachers can provide faster feedback, track progress more systematically, and assess practical outputs in more varied ways. For policy development, schools should institutionalize digital rubrics, e-portfolios, and secure assessment platforms. Assessment innovation must be accompanied by standards for fairness, accessibility, and data privacy.

Table 5. Summary of the Extent of ICT Integration Practices in Teaching Home Economics

Domain	East Mean	West Mean	Average Mean	Interpretation	Rank
Motivation	4.85	4.85	4.85	VME	4
Presentation	4.90	4.88	4.89	VME	2
Discussion	4.91	4.87	4.89	VME	2
Assessment	4.92	4.85	4.89	VME	2
Average	4.90	4.86	4.88	VME	

The summary table shows that ICT integration practices were very much evident across all instructional domains, with an overall mean of 4.88. Presentation, discussion, and assessment each obtained an average mean of 4.89, while motivation obtained 4.85. The narrow range of means indicates that ICT integration is not concentrated in one instructional stage but is distributed across the teaching cycle. This reflects a mature pattern of practice where teachers employ technology before, during, and after lesson delivery.

The East District recorded an overall mean of 4.90, while the West District recorded 4.86, both interpreted as very much evident. This suggests that both respondent groups demonstrate high ICT integration despite possible differences in local school conditions. The high rating in the East District for assessment and discussion reflects strong digital evaluation and interaction practices. The West District also demonstrated consistently high ratings, especially in presentation.

The table further implies that Grade 4 Home Economics teachers are using ICT not as an isolated enhancement but as a regular instructional resource. The integration of ICT across motivation, presentation, discussion, and assessment shows alignment with learner-centered, technology-supported pedagogy. Such integration is especially meaningful in Home Economics because learners need demonstration, participation, collaboration, and authentic evidence of skill development. This pattern supports the conclusion that ICT is already embedded in the instructional routines of the teachers.

At the same time, a very high level of practice does not automatically mean that implementation is problem-free. The later challenge tables show that teachers still encounter serious barriers related to infrastructure, gadgets, ICT skills, and professional networking. Thus, the summary of practice must be interpreted with the challenge data. Sustained ICT integration requires policy support that protects and strengthens these already evident practices.

Table 6. Test of Significant Difference on the Rank Orders of ICT Integration Practices

Domain	Cases	Computed z	p-value	Decision	Significance
Motivation	24	-0.17	0.4325	Accepted	Not Significant
Presentation	26	-0.05	0.4801	Accepted	Not Significant
Discussion	24	-0.2	0.4207	Accepted	Not Significant
Assessment	20	-0.94	0.1736	Accepted	Not Significant

The Wilcoxon Mann-Whitney U test showed no significant difference in the rank orders of ICT integration practices across all four domains. Motivation obtained a z-value of -0.17 and p-value of 0.4325; presentation obtained -0.05 and 0.4801; discussion obtained -0.20 and 0.4207; and assessment obtained -0.94 and 0.1736. All p-values exceeded the 0.05 level of significance. Therefore, the null hypothesis was accepted for all ICT integration practice domains.

This result indicates that teachers from the two groups perceived ICT integration practices in broadly similar ways. The absence of significant differences suggests a relatively uniform implementation of ICT across Jose Panganiban East and West Districts. Such uniformity may be associated with common DepEd expectations, shared digital platforms, similar curriculum standards, and comparable teacher exposure to ICT-based instructional strategies. It also implies that ICT integration is not confined to a particular respondent group.

From an administrative perspective, this finding is positive because it points to consistency in instructional technology practices. District-level supervisors may use this consistency as a foundation for scaling up advanced ICT integration initiatives. Since both groups already show high levels of practice, future interventions can focus on deepening quality rather than introducing ICT from the beginning. Professional development may therefore move from basic tool use to pedagogical design, digital assessment quality, and technology-enhanced performance tasks.

However, the lack of significant difference should not be interpreted as a lack of need for support. It only means that the two groups do not differ significantly in rank orders, not that all conditions are ideal. As the challenge findings indicate, both groups experience serious barriers that can weaken sustained implementation. The significance test therefore strengthens the argument for system-wide rather than group-specific support, except where challenge data show otherwise.

Table 7. Challenges in ICT Integration along Internet Connectivity

## RESEARCH ARTICLE

Indicator	Average Mean	Interpretation	Rank
Slow internet hinders smooth video streaming in lessons.	4.76	VMC	7
Unstable connections disrupt online discussions.	5.00	VMC	2
Limited access to high-speed internet affects digital activities.	4.70	VMC	9.5
Cloud-based learning is affected by frequent disconnections.	4.78	VMC	6
Teachers struggle with downloading large instructional files.	4.70	VMC	9.5
Online assessments are delayed due to connection issues.	5.00	VMC	2
Virtual meetings experience frequent interruptions.	4.58	VMC	12
Teachers face challenges updating digital resources.	5.00	VMC	2
Some learners have poor internet access at home.	4.83	VMC	5
Teachers are forced to use offline alternatives due to unreliable connectivity.	4.89	VMC	4
Video buffering reduces lesson effectiveness.	4.75	VMC	8
Online simulations and virtual labs require high-speed internet, which is often unavailable.	4.48	MC	13
Teachers and learners experience difficulty accessing cloud storage.	4.67	VMC	11
Average	4.78	VMC	

Internet connectivity obtained an average mean of 4.78, interpreted as very much challenging. The highest-rated indicators were unstable connections disrupting online discussions, delayed online assessments, and difficulty updating digital resources, each with a mean of 5.00. These results show that connectivity affects both instructional delivery and administrative preparation. Teachers cannot fully maximize ICT when the basic network infrastructure is unreliable.

The high ratings for being forced to use offline alternatives, poor learner access at home, cloud-based interruptions, slow streaming, video buffering, and difficulty downloading files indicate that connectivity problems are multidimensional. They affect synchronous interaction, asynchronous access, resource preparation, assessment, and learner participation. In Home Economics, this can reduce the effectiveness of virtual laboratories, video demonstrations, and cloud-based collaborative activities. Connectivity therefore acts as a gatekeeping condition for many advanced ICT practices.

The lowest-rated indicator, online simulations and virtual laboratories requiring high-speed internet that is often unavailable, was still interpreted as much challenging. This suggests that even the least severe connectivity issue remains a concern. The challenge is especially serious because simulations and virtual laboratories can be highly relevant to Home Economics skills instruction. Without stable internet, these tools may remain underused despite their pedagogical value.

The findings imply that connectivity improvement should be treated as an instructional priority rather than merely a technical concern. Schools, local government units, DepEd, and DICT must coordinate to improve bandwidth, access points, and alternative offline resource systems. Teachers also need support in designing hybrid lesson plans that can function during connectivity interruptions. Such planning can protect learning continuity while long-term infrastructure improvements are pursued.

Table 8. Challenges in ICT Integration along Availability of Gadgets

Indicator	Average Mean	Interpretation	Rank
Not all learners have personal devices for digital learning.	4.80	VMC	8
Teachers share devices, limiting preparation time.	4.95	VMC	5
Some schools lack computer labs for ICT integration.	5.00	VMC	2.5
Smartphones are not always compatible with digital learning tools.	4.90	VMC	6
Teachers struggle with outdated computers.	5.00	VMC	2.5
Limited access to projectors and smart boards affects presentations.	4.83	VMC	7
Learners face difficulty completing digital assignments without personal devices.	5.00	VMC	2.5
Not all classrooms have enough tablets or laptops.	4.70	VMC	9
Some learners rely on borrowed devices, creating inconsistency in learning.	5.00	VMC	2.5
Average	4.91	VMC	

Availability of gadgets obtained the highest challenge mean of 4.91, interpreted as very much challenging. Perfect mean scores were recorded for lack of computer laboratories, outdated computers, learners' difficulty completing digital assignments without personal devices, and reliance on borrowed devices. These results indicate that device access is a major constraint for both teachers and learners. ICT integration cannot be equitable when access to essential equipment is uneven.

The high rating for teachers sharing devices shows that even teacher preparation time is affected by limited resources. In practice, teachers may have the willingness and skills to integrate ICT but lack sufficient tools to prepare, present, or assess lessons efficiently. Limited access to projectors, smart boards, tablets, and laptops also reduces the feasibility of interactive and multimedia instruction. Device scarcity therefore weakens the translation of digital pedagogy into daily classroom practice.

Learner access is equally important because many ICT-based tasks require personal or shared devices. When learners rely on borrowed devices or have no personal gadgets, their participation becomes inconsistent. This can affect digital assignments, e-portfolios, online quizzes, web-based research, and multimedia outputs. The result is a risk of widening learning gaps between learners who have devices and those who do not.

The findings imply that gadget procurement, lending systems, and equipment maintenance should be institutionalized. Schools should conduct regular inventories and prioritize equipment that directly supports Home Economics instruction, such as projectors, tablets, laptops, and multimedia devices. Division offices and local government units may consider device loan programs for teachers and learners. Without such support, high teacher motivation for ICT integration may be constrained by material scarcity.

Table 9. Challenges in ICT Integration along Knowledge of ICT Utilization and Application

Indicator	Average Mean	Interpretation	Rank
Some teachers struggle with integrating ICT into lesson planning.	5.00	VMC	4
Not all teachers are trained in using advanced digital tools.	4.79	VMC	10
Fear of technology limits ICT adoption in lessons.	5.00	VMC	4
Teachers need more hands-on training in multimedia creation.	4.80	VMC	8
Difficulty in troubleshooting technical issues affects lesson flow.	5.00	VMC	4
Some teachers prefer traditional methods over ICT-based instruction.	4.69	VMC	12
Limited knowledge of online collaborative tools affects group activities.	5.00	VMC	4
Teachers struggle with adapting ICT to diverse learning styles.	5.00	VMC	4
Lack of familiarity with online assessment tools creates challenges.	4.74	VMC	11
Some educators have difficulty selecting appropriate digital resources.	5.00	VMC	4
Integration of ICT into practical lessons (e.g., sewing, cooking) is not well understood.	4.61	VMC	13
Teachers require ongoing ICT-related professional development.	5.00	VMC	4
Some schools lack ICT mentors to guide teachers.	4.80	VMC	9
Average	4.88	VMC	

Knowledge of ICT utilization and application obtained an average mean of 4.88, interpreted as very much challenging. Several indicators received perfect mean scores, including difficulty integrating ICT into lesson planning, fear of technology, troubleshooting problems, limited knowledge of collaborative tools, difficulty adapting ICT to diverse learning styles, difficulty selecting digital resources, and the need for ongoing professional development. These findings show that teacher capability remains a critical condition for meaningful ICT integration. Access to tools alone is insufficient without confident and pedagogically sound use.

The data indicate that teachers face both technical and pedagogical challenges. Troubleshooting problems can interrupt lesson flow, while difficulty in lesson planning affects the design stage before instruction begins. Limited knowledge of collaborative and assessment tools also constrains discussion and evaluation activities. These challenges directly affect the quality of ICT integration across motivation, presentation, discussion, and assessment.

The presence of fear of technology as a top-rated challenge is particularly important. It suggests that some teachers may experience anxiety or hesitation when using unfamiliar digital tools. Such fear can lead to reliance on traditional methods even when ICT tools are available. Professional development should therefore include mentoring, hands-on practice, peer coaching, and safe spaces for teachers to experiment without fear of failure.

The findings imply that professional development must be continuous, practical, and subject-specific. Generic ICT training may not be enough for Home Economics teachers who need to integrate technology into practical lessons such as cooking, sewing, budgeting, and household management. Training should therefore focus on lesson design, multimedia creation, online assessment, troubleshooting, and adaptation to learner diversity. ICT-skilled teachers may also serve as mentors for colleagues who need classroom-based support.

Table 10. Challenges in ICT Integration along Networking

Indicator	Average Mean	Interpretation	Rank
Teachers lack access to professional learning communities for ICT integration.	4.84	VMC	8.5
Limited school partnerships restrict exposure to new technologies.	4.78	VMC	11
Schools struggle with forming ICT-based collaborations with other institutions.	5.00	VMC	2
Insufficient technical support hinders troubleshooting.	4.84	VMC	8.5
Teachers have limited opportunities to share best practices with peers.	4.88	VMC	6.5
Inadequate access to ICT conferences and training.	5.00	VMC	2
Schools lack connections with tech companies for resource support.	4.96	VMC	5
Teachers need more networking opportunities with ICT experts.	4.78	VMC	11

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Indicator	Average Mean	Interpretation	Rank
Collaboration tools are underutilized due to lack of training.	4.78	VMC	11
School administrators need stronger ICT networking initiatives.	4.77	VMC	13
Limited access to global digital education forums.	4.97	VMC	4
Teachers struggle with professional networking for ICT skill enhancement.	4.88	VMC	6.5
ICT partnerships with parents and the community are minimal.	5.00	VMC	2
Average	4.88	VMC	

Networking obtained an average mean of 4.88, interpreted as very much challenging. The highest-rated indicators included schools struggling to form ICT-based collaborations with other institutions, inadequate access to ICT conferences and training, and minimal ICT partnerships with parents and the community. These findings show that teachers' ICT integration is affected not only by internal school resources but also by external professional and institutional linkages. Networking is essential for sustaining innovation beyond individual effort.

The high ratings for limited access to global digital education forums, lack of connections with technology companies, limited opportunities to share best practices, and weak professional learning communities indicate a constrained support ecosystem. Teachers may be implementing ICT mostly within their own classrooms without sufficient exposure to wider communities of practice. This limits opportunities for troubleshooting, sharing resources, and learning emerging tools. In technology integration, professional isolation can slow improvement.

The data also show that technical support and collaboration tools are underutilized or insufficiently supported. When technical assistance is weak, teachers spend time solving equipment or platform issues instead of focusing on instruction. When collaboration tools are underused due to lack of training, opportunities for cooperative planning and learner collaboration are reduced. Networking challenges therefore intersect with knowledge and infrastructure challenges.

The findings imply that schools need stronger ICT networks involving DepEd offices, DICT, local government units, teacher education institutions, parents, and private-sector partners. Professional learning communities should be established to allow teachers to exchange practices and digital resources. Schools may also formalize partnerships with technology providers and training organizations. Strengthening networks can make ICT integration more sustainable, updated, and responsive to teacher needs.

Table 11. Summary of the Challenges Met by Teachers in ICT Integration Practices

Challenge Area	East Mean	West Mean	Average Mean	Interpretation	Rank
Internet Connectivity	4.88	4.68	4.78	VMC	4
Availability of Gadgets	4.93	4.88	4.91	VMC	1
Knowledge of ICT Utilization and Application	4.88	4.88	4.88	VMC	2.5
Networking	4.88	4.88	4.88	VMC	2.5
Average	4.89	4.83	4.86	VMC	

The challenge summary shows an overall mean of 4.86, interpreted as very much challenging. Availability of gadgets ranked first with a mean of 4.91, followed by knowledge of ICT utilization and application and networking, both with a mean of 4.88. Internet connectivity ranked fourth with a mean of 4.78, but it remained very much challenging. These results reveal that barriers to ICT integration are severe across all measured areas.

The pattern of results suggests that the main concern is not teacher resistance to ICT integration. In fact, the practice tables show that teachers are already integrating ICT at a very high level. The challenge is that their integration occurs within conditions of limited gadgets, unstable connectivity, uneven technical competence, and insufficient professional networks. This creates a gap between instructional aspiration and operational support.

The East District recorded an average challenge mean of 4.89, while the West District recorded 4.83, both very much challenging. The difference is not large in the summary, but it suggests that teachers in both groups experience substantial barriers. Since all challenge domains scored high, interventions should not address only one issue. A comprehensive ICT support plan should include infrastructure, equipment, capacity-building, mentoring, partnerships, and monitoring.

The findings imply that sustaining ICT integration in Home Economics requires a systems approach. Training alone cannot resolve gadget shortages, and device procurement alone cannot solve teacher capability issues. Similarly, connectivity upgrades must be accompanied by technical support and instructional resource development. The challenge profile therefore calls for coordinated action among school heads, division offices, local government units, DICT, and teacher education institutions.

Table 12. Test of Significant Difference on the Rank Orders of ICT Integration Challenges

Challenge Area	Cases	Computed z	p-value	Decision	Significance
Internet Connectivity	26	-1.72	0.0427	Rejected	0.05
Availability of Gadgets	18	-0.53	0.2981	Accepted	Not Significant
Knowledge of ICT Utilization and Application	26	-0.09	0.4641	Accepted	Not Significant

Challenge Area	Cases	Computed z	p-value	Decision	Significance
Application					
Networking	23	-0.26	0.3974	Accepted	Not Significant

The Wilcoxon Mann-Whitney U test for challenges showed mixed results. Internet connectivity obtained a computed z-value of -1.72 and probability of 0.0427, which is below the 0.05 significance level. Thus, the null hypothesis was rejected for internet connectivity. This indicates a significant difference in the rank orders of connectivity challenges between the two respondent groups.

Availability of gadgets, knowledge of ICT utilization and application, and networking were not significantly different. Their p-values were 0.2981, 0.4641, and 0.3974, respectively, all greater than 0.05. The null hypothesis was therefore accepted for these three areas. This implies that the two groups experienced gadget, knowledge, and networking challenges in broadly similar ways.

The significant result for internet connectivity is important because it points to unequal infrastructure conditions. One group may experience connectivity-related disruption more strongly than the other, which affects the consistency of online activities, assessments, cloud-based resources, and virtual meetings. This finding calls for targeted connectivity intervention rather than a uniform response. Connectivity support should be prioritized in the areas where disruption is more severe.

The non-significant findings for other challenges indicate that certain barriers are systemic across the two groups. Device availability, teacher ICT competence, and networking support should therefore be addressed district-wide. Meanwhile, connectivity should be addressed through both district-wide policy and localized infrastructure improvement. This differentiated response can make policy recommendations more precise and implementation more efficient.

#### **4. Conclusions and Implications**

##### *4.1 Conclusions*

The study concludes that ICT integration practices in teaching Grade 4 Home Economics in Jose Panganiban East and West Districts are very much evident. Teachers demonstrate strong integration across motivation, presentation, discussion, and assessment, showing that ICT has become part of the instructional cycle. The results indicate that digital tools are used not merely as supplementary aids but as meaningful supports for learner engagement, content delivery, interaction, and evaluation. This level of practice reflects readiness among teachers to implement technology-enhanced Home Economics instruction.

The strongest areas of ICT integration were presentation, discussion, and assessment, each with a mean of 4.89. These findings suggest that teachers are particularly effective in using technology to explain concepts, facilitate learner participation, and evaluate learning outcomes. The use of multimedia presentations, virtual demonstrations, digital platforms, e-portfolios, and online assessment tools shows a diversified technology repertoire. Such practices support more interactive, visible, and learner-centered Home Economics instruction.

Motivation also emerged as very much evident, with a mean of 4.85. Teachers use multimedia, virtual tours, motivational videos, digital posters, polls, games, and storytelling to increase learner interest. These practices suggest that ICT is effective in preparing learners emotionally and cognitively for Home Economics lessons. Motivation through ICT makes lessons more relevant, attractive, and connected to real-life applications.

There is no significant difference in the rank orders of ICT integration practices along motivation, presentation, discussion, and assessment. This means that teachers from the two respondent groups demonstrate comparable patterns of ICT integration. The finding suggests consistency in instructional technology practices across the study locale. Such consistency may be used as a foundation for district-wide enhancement programs.

The study also concludes that teachers encounter very much challenging conditions in ICT integration. The highest challenge was availability of gadgets, followed by knowledge of ICT utilization and application, networking, and internet connectivity. These barriers show that the sustainability of ICT practices is threatened by material, technical, professional, and infrastructural constraints. High implementation therefore coexists with high difficulty.

Device scarcity is the most pressing challenge based on the findings. Teachers and learners face difficulties related to lack of computer laboratories, outdated computers, borrowed or shared devices, and insufficient projectors, smart boards, tablets, and laptops. This condition affects both preparation and learner participation. Without adequate gadgets, ICT integration may become uneven and difficult to sustain.

Internet connectivity is the only challenge area with a significant difference between respondent groups. This means that connectivity problems are not experienced uniformly and may require location-specific interventions. Online discussions, assessments, cloud storage, resource updating, and video streaming are directly affected by unstable internet. Connectivity must therefore be treated as a priority infrastructure concern.

Policy recommendations are necessary because the findings reveal both strong teacher practice and serious implementation barriers. Teachers are already integrating ICT extensively, but their work requires stronger institutional support. The recommended actions include improving internet infrastructure, providing gadgets, strengthening ICT training, building mentoring systems, developing Home Economics e-learning resources, and conducting periodic monitoring. These actions can protect current gains and expand the quality of ICT integration.

##### *4.2 Implications*

For learners, the findings imply that ICT-supported Home Economics can make learning more engaging, interactive, and practical. Digital tools allow learners to visualize procedures, participate in discussions, demonstrate skills, and track their progress.

However, learners without personal devices or stable internet may not fully benefit from these opportunities. Equity in access must therefore be central to all ICT integration policies.

For teachers, the findings imply that professional competence in ICT must be continuously developed. Teachers already use digital tools extensively, but they still report difficulty with lesson planning, troubleshooting, advanced digital tools, online collaboration, and technology adaptation. Professional development should be hands-on, sustained, and directly connected to Home Economics competencies. Peer mentoring and coaching can help teachers move from basic usage to more sophisticated pedagogical integration.

For school heads, the results imply the need for stronger instructional leadership in ICT integration. School heads should not only require technology use but also ensure that teachers have access to devices, technical support, and time for preparation. ICT integration benchmarks may be included in planning, monitoring, and performance appraisal systems. Leadership support is crucial in transforming individual teacher practice into institutional culture.

For ICT coordinators and school ICT teams, the findings imply the need for localized technical assistance systems. Teachers need help with troubleshooting, selecting appropriate digital tools, using online assessment platforms, and maintaining equipment. ICT support should be proactive rather than limited to emergency repair. Regular coaching and resource-sharing sessions can reduce teacher anxiety and improve implementation quality.

For DepEd division and regional offices, the study implies that ICT integration must be supported through funding, infrastructure, monitoring, and resource development. Division supervisors should periodically evaluate ICT integration practices and challenges to identify schools needing priority assistance. Region-level policies should also support internet upgrades, device procurement, and contextualized digital learning resources. Such support would align classroom practice with broader digital education goals.

For local government units and DICT, the findings imply the need for active partnership with schools. Connectivity problems and gadget shortages cannot be solved by teachers alone. Local governments may support subsidized internet access, community learning hubs, device donations, and infrastructure projects. DICT may partner with DepEd to deploy mobile technology hubs and technical assistance to underserved schools.

For curriculum planners and teacher education institutions, the study implies that ICT integration should be embedded in Home Economics lesson exemplars and preservice teacher preparation. Future teachers should be trained to use digital tools for motivation, presentation, discussion, and assessment. Curriculum materials should include examples of technology-supported practical tasks, e-portfolios, video-based demonstrations, and digital rubrics. This will help ensure continuity between teacher preparation and classroom realities.

For future researchers, the findings imply the need for deeper studies on the quality and impact of specific ICT tools in Home Economics. Future studies may examine learner performance, engagement, skill acquisition, and equity outcomes associated with digital tools. Comparative research across districts, grade levels, and subject areas may also reveal broader patterns of ICT integration. Longitudinal studies may determine whether ICT training and infrastructure improvements result in sustained changes in teaching practice.

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