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ICT Integration and Perceived Learner Technology Readiness in Public Elementary Schools in Occidental Mindoro: Basis for an ICT Integration Plan

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ABSTRACT

Background. Information and communication technology (ICT) can expand access to learning, support interactive pedagogy, and strengthen school administration, but remote and resource-constrained schools continue to face device, connectivity, and training gaps. **Objective.** This study assessed ICT integration and perceived learner technology readiness in public elementary schools in the Division of Occidental Mindoro and used the findings to develop an ICT integration plan. **Methods.** A descriptive survey design with comparative and correlational analyses was used during School Year 2023-2024. The survey included 182 elementary teachers and 37 school heads selected from populations of 342 teachers and 40 school heads. Supplementary interviews were conducted with 12 teachers and administrators. A researcher-developed four-point questionnaire measured five ICT-integration domains and three technology-readiness dimensions. Weighted means, standard deviations, t tests, and Pearson correlations were reported. **Results.** All five ICT-integration domains were interpreted as being implemented to a great extent, with overall means ranging from 3.52 to 3.59. Access technology ($M = 3.65$, $SD = 0.42$) and attitudes and perceptions ($M = 3.66$, $SD = 0.43$) were rated very high. The source reported software application as high ($M = 3.15$, $SD = 0.45$), but this composite is internally inconsistent with its item-level values and requires verification. A marginal group difference was reported for organization and administration ($p = .050$), and a difference was reported for attitudes and perceptions ($p = .041$). ICT-integration domains correlated positively with access technology ($r = .47$-$.50$, all $p < .01$) and software integration ($r = .53$-$.55$, all $p < .01$). Interviews identified outdated or insufficient equipment, limited internet access, inadequate laboratory capacity, and insufficient training and technical support. **Conclusion.** Educators perceived ICT integration as extensive, yet the weakest indicators and interview evidence show that infrastructure, connectivity, coaching, and continuous evaluation remain critical. A phased plan should combine resource improvement with sustained professional and technical support. Statistical discrepancies must be resolved before submission.

KEYWORDS information and communication technology | technology readiness | elementary schools | teacher professional development | digital divide | Philippines

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1 Introduction

Quality education increasingly depends on the ability of schools to provide learners with digital knowledge, skills, and opportunities for meaningful participation in a technology-rich society. ICT can support multimodal instruction, collaboration, formative assessment, school management, and access to educational resources. Its educational value, however, depends on more than the presence of devices. Effective integration also requires suitable infrastructure, pedagogical capacity, organizational support, and equitable access. These conditions are especially important in rural and geographically dispersed settings where the digital divide may compound existing educational inequalities (UNESCO, 2015; Van Dijk, 2016).

In the Philippines, the Department of Education has promoted digital learning through the DepEd Computerization Program and, during the COVID-19 disruption, through online resources such as DepEd Commons (Department of Education, 2020, 2021). The rapid shift to remote and blended learning demonstrated the usefulness of digital platforms while also exposing persistent barriers involving internet connectivity, device availability, technical support, and teacher preparation. International and local studies similarly indicate that technology adoption is shaped by educators' beliefs, confidence, training, and institutional support, not only by hardware provision (Ertmer & Ottenbreit-Leftwich, 2020; Selwyn, 2016).

These challenges are salient in Occidental Mindoro, where many public elementary schools serve geographically remote and economically constrained communities. The dissertation described frequent power and connectivity limitations, insufficient and outdated equipment, logistical difficulty in maintaining ICT resources, and uneven exposure to digital tools among teachers and learners. Such conditions can restrict the use of online content, multimedia instruction, cloud-based collaboration, and technology-supported assessment even when teachers and school leaders recognize the value of ICT.

Previous Philippine studies have reported that teacher preparedness and acceptance are related to classroom ICT practices (Hero, 2020; Estigoy, 2021), while other work has documented persistent gaps in infrastructure, training, and coherent implementation systems (Bibad, 2012; Dela Rosa, 2016; Nacario, Osea, & Foronda, 2021). However, local evidence was needed to describe how school heads and teachers in Occidental Mindoro assessed ICT integration across curriculum and assessment, pedagogy, organization and administration, professional learning, and technology tools, and how these assessments related to perceived learner technology readiness.

The study was conceptually informed by constructivist learning, Walberg's educational productivity theory, Bandura's self-efficacy theory, and cognitive learning perspectives. Together, these perspectives emphasize active and socially supported learning, the interaction of learner and environmental factors, the role of confidence in technology use, and the cognitive skills required to apply ICT effectively.

1.1 Study Aim

The study aimed to assess the extent of ICT integration and the level of perceived learner technology readiness in public elementary schools in the Division of Occidental Mindoro and to develop an ICT integration plan. Specifically, it examined five ICT-integration domains; three technology-readiness dimensions; differences between school-head and teacher assessments; reported variations among domains and dimensions; relationships between ICT integration and technology readiness; and the issues and concerns identified through interviews.

2 Materials and Methods

2.1 Research Design

The dissertation used a descriptive research design. For the present manuscript, the design is described more precisely as a descriptive survey with comparative and correlational analyses and a supplementary interview component. Data were collected during School Year 2023-2024. Because the design was cross-sectional and based primarily on educator reports, associations should not be interpreted as causal.

2.2 Setting

The study was conducted in public elementary schools in the Division of Occidental Mindoro, MIMAROPA Region, Philippines. The source emphasizes that schools in the division include remote and resource-constrained settings.

2.3 Participants and Sampling

The source population comprised 342 elementary teachers and 40 school heads. Using the Raosoft sample-size calculator with a reported 5% margin of error, the study selected 182 teachers and 37 school heads, for a total survey sample of 219 respondents. Simple random sampling was reported. In addition, 12 teachers and administrators were invited for interviews about issues and concerns in ICT integration.

2.4 Research Instruments

A researcher-developed questionnaire was based on readings from books, periodicals, and related unpublished materials. The first part measured ICT integration in five domains: curriculum and assessment, pedagogy, organization and administration, teacher professional learning, and technology tools. The second part measured technology readiness in three dimensions: access technology, attitudes and perceptions, and software application. Each domain or dimension contained 10 indicators and used a four-point response scale.

For ICT integration, scores of 3.50-4.00 were interpreted as great extent, 2.50-3.49 as moderate extent, 1.50-2.49 as slight extent, and 1.00-1.49 as least extent. For technology readiness, the corresponding interpretations were very high, high, low, and very low. The questionnaire was reviewed by the adviser, revised, and submitted to the three experts in the field for validation.

A semi-structured interview guide was used to obtain more detailed accounts of issues and concerns. The guide moved from introductory to more specific questions and included probes for clarification. Interviews were documented and done face to face through detailed notes or recording with participant permission.

2.5 Data-Gathering Procedure

Permission was requested from the Schools Division Superintendent. Questionnaires were administered personally and, in some cases, through an online platform using Messenger. A cover letter explained the study, its objectives, and contact information. Completed responses were collected, tabulated, and subjected to statistical analysis. For the interview component, the researcher arranged schedules, established a respectful environment, followed the interview guide while allowing probing, and concluded by thanking participants and providing follow-up information.

2.6 Ethical Considerations

Participation was described as voluntary. Respondents could decline to answer questions or withdraw, and they were informed that responses would be used only for the research. Confidentiality, anonymity, privacy, and relevant provisions of the Philippine Data Privacy Act were observed. The topics has undergone review of the university ethics committee.

2.7 Data Analysis

Weighted means and standard deviations summarized ICT integration and technology readiness. T tests were used to compare school-head and teacher assessments. Pearson product-moment correlations examined relationships between ICT-integration domains and reported readiness dimensions. The dissertation also presented pairwise variations among domains and dimensions, but the statistical test used for these comparisons was not identified.

Interview responses were used to identify recurring issues and concerns. Because the source does not describe a formal qualitative analytic method, the present manuscript reports the interview findings as descriptive themes rather than claiming a fully developed thematic analysis.

3 Results and Discussion

3.1 Results

3.1.1 Participants

The survey included 219 respondents: 182 elementary teachers and 37 school heads. The interview component involved 12 teachers and administrators; the source did not report their distribution by role or school.

3.1.2 Extent of ICT Integration and Technology Readiness

All five ICT-integration domains were classified at the overall level as being implemented to a great extent. Overall means ranged from 3.52 for curriculum and assessment to 3.59 for technology tools. Access technology and attitudes and perceptions were classified as very high. The software-application table reported a high composite mean of 3.15, but most of its item means were much higher; this discrepancy prevents confident interpretation until the source data are verified.

Table 1. Composite assessments of ICT integration and technology readiness

Domain or dimension	School heads M (SD)	Teachers M (SD)	Overall M (SD)	Reported interpretation
ICT integration: Curriculum and assessment	3.52 (0.526)	3.52 (0.507)	3.52 (0.511)	Great extent
ICT integration: Pedagogy	3.54 (0.51)	3.56 (0.50)	3.55 (0.50)	Great extent
ICT integration: Organization and administration	3.52 (0.52)	3.56 (0.50)	3.54 (0.50)	Great extent
ICT integration: Teacher professional learning	3.54 (0.47)	3.60 (0.41)	3.58 (0.42)	Great extent*
ICT integration: Technology tools	3.56 (0.46)	3.61 (0.42)	3.59 (0.44)	Great extent
Technology readiness: Access technology	3.60 (0.47)	3.65 (0.41)	3.65 (0.42)	Very high
Technology readiness: Attitudes and perceptions	3.62 (0.50)	3.65 (0.41)	3.66 (0.43)	Very high
Technology readiness: Software application	3.12 (0.51)	3.18 (0.43)	3.15 (0.45)	High**

*Note. *The source table labels the school-head and teacher composite interpretations for professional learning as moderate extent even though the reported means fall within the stated great-extent range.*

The highest- and lowest-rated indicators show a consistent pattern. Respondents reported frequent use or support for familiar, immediately usable digital practices such as multimedia presentations, virtual meetings, electronic platforms, and interactive modules. Lower ratings were concentrated in blended-learning design, reliable access, infrastructure maintenance, individualized coaching, continuous evaluation, cloud-based collaboration, and ongoing learner support.

Table 2. Highest- and lowest-rated indicators by domain or dimension

Domain or dimension	Highest-rated indicator (overall M)	Lowest-rated indicator(s) (overall M)
Curriculum and assessment	Integrate specific ICT skills into the curriculum (3.68)	Combine traditional and online learning approaches (3.24)
Pedagogy	Create engaging multimedia presentations (3.69)	Use Twitter or Instagram for short educational challenges or updates (3.30)
Organization and administration	E-governance and electronic administrative platforms (3.71 each)	Update IT infrastructure and use ongoing online learning platforms (3.25 each)*
Teacher professional learning	Provide interactive modules for teachers (3.85)	Implement continuous evaluation of ICT integration (3.12); provide ICT coaches (3.14)
Technology tools	Virtual classes/guest lectures and digital textbooks/e-books (3.80 each)	Cloud-based collaboration and interactive multimedia lessons (3.19 each)
Access technology	Evaluate familiarity with digital devices (3.80)	Determine availability and reliability of device and internet access (3.14)
Attitudes and perceptions	Willingness to embrace and perceived importance of digital literacy (3.79 each)	Assess attitudes toward adopting new technologies or processes (3.35)
Software application	Create a survey or self-assessment on software application (3.78)	Provide ongoing support and follow-up sessions (3.27)

3.1.3 Differences Between School Heads and Teachers

The dissertation reported no group differences for curriculum and assessment, pedagogy, teacher professional learning, technology tools, access technology, or software application. Organization and administration were classified as significantly different at p = .050, with a slightly higher mean among school heads. Attitudes and perceptions also differed (p = .041), with teachers reporting a slightly higher mean. The organization-and-administration result is marginal and depends on the journal's treatment of a rounded p value equal to the decision threshold.

Table 3. Reported group comparisons for ICT integration and technology readiness

Construct	School-head mean	Teacher mean	t	p	Source decision
Curriculum and assessment	3.66	3.61	0.834072	.405	Not significant
Pedagogy	3.70	3.64	0.820863	.413	Not significant
Organization and administration	3.69	3.64	0.905378	.050	Significant*
Teacher professional learning	3.72	3.78	-1.23404	.219	Not significant
Technology tools	3.73	3.77	-1.03536	.302	Not significant
Access technology	3.60	3.65	-0.834	.405	Not significant
Attitudes and perceptions	3.62	3.65	-0.821	.041	Significant
Software application	3.52	3.58	-0.905	.366	Not significant**

3.1.4 Reported Variations Among Domains and Dimensions

Within ICT integration, the source reported significant pairwise variations between curriculum and assessment and teacher professional learning (mean difference = 0.15, p = .05), curriculum and assessment and technology tools (0.14, p = .05), pedagogy and teacher professional learning (0.12, p = .05), and pedagogy and technology tools (0.11, p = .05). Other pairings were reported as not significant. Within technology readiness, access technology versus software application was reported as highly significant (mean difference = 0.03, p = .01), and attitudes and perceptions versus software application was reported as significant (0.01, p = .05).

3.1.5 Relationships Between ICT Integration and Technology Readiness

All five ICT-integration domains were positively associated with access technology and software integration. Correlations with access technology ranged from r = .47 to .50, while correlations with software integration ranged from r = .53 to .55. The reported coefficients of determination ranged from .22 to .31, indicating that the paired variables shared approximately 22%-31% of variance. These associations were reported as highly significant at p < .01.

Table 4. Reported correlations of ICT-integration domains with access technology and software integration

ICT-integration domain	Access r	Access R^2	p	Software r	Software R^2	p
Curriculum and assessment	.50	.25	< .01	.55	.31	< .01
Pedagogy	.48	.23	< .01	.55	.30	< .01
Organization and administration	.47	.22	< .01	.55	.30	< .01
Teacher professional learning	.48	.23	< .01	.55	.30	< .01
Technology tools	.47	.22	< .01	.53	.28	< .01

3.1.6 Issues and Concerns Identified in Interviews

Interview responses described four interrelated constraints. First, schools reported outdated software and equipment, insufficient computers and projectors, limited maintenance capacity, and inadequate funding. Second, participants described absent or unreliable internet access; nine participants reportedly supported the statement that internet was unavailable even in the ICT laboratory, and almost all reportedly indicated that classrooms lacked internet access. Third, teachers described insufficient in-service training, few school-based professional-development opportunities, and limited

access to knowledgeable ICT personnel. Fourth, access to laboratories was constrained by inadequate space, shared computers, limited time slots, and rules that restricted regular use.

Table 5. Descriptive themes from the interview component

Theme	Reported evidence	Implication for the plan
Infrastructure and resources	Outdated software and computers; insufficient devices and projectors; one laboratory serving many learners; limited funding and maintenance capacity.	Prioritize inventory, repair, replacement, licensing, and equitable allocation.
Internet connectivity	Reports of no internet in ICT laboratories or classrooms and difficulty sustaining technology-supported learning.	Combine connectivity investment with offline-capable resources and contingency planning.
Teacher training and support	Insufficient in-service training, few school-based professional-learning opportunities, and limited access to trained ICT personnel.	Provide recurring, practice-based training, mentoring, coaching, and help-desk support.
Access, scheduling, and utilization	Shared devices, inadequate laboratory space, limited time allocations, and restrictive access practices.	Use transparent scheduling, mobile or classroom-based resources, and monitoring of actual use.

3.2 Discussion

The study presents an apparently favorable picture of ICT integration: all five domains were rated at a great extent, and the highest items involved familiar and accessible practices such as presentations, videos, virtual meetings, electronic administrative platforms, digital textbooks, and interactive professional-learning modules. These practices can be adopted incrementally and may have become more familiar during the rapid expansion of remote and blended learning. Similar Philippine studies have linked teacher preparedness and acceptance with stronger ICT-integration practices (Hero, 2020; Estigoy, 2021).

The composite results, however, should not be interpreted as evidence that schools possess uniformly adequate digital infrastructure. The lowest indicators consistently involved the conditions needed to sustain deeper integration: reliable devices and internet, blended-learning design, infrastructure maintenance, individualized coaching, continuous evaluation, cloud collaboration, interactive multimedia development, and follow-up support. Interview findings reinforced these weaknesses by describing outdated software, insufficient equipment, limited laboratory capacity, and absent internet access. This pattern is consistent with earlier work showing that Philippine schools may value ICT while remaining constrained by funding, connectivity, and coherent implementation systems (Bibad, 2012; Dela Rosa, 2016; Nacario et al., 2021).

The high access-technology score should also be interpreted cautiously. Many items in the access scale assess awareness, policy, evaluation, and encouragement rather than directly measuring the actual availability, reliability, or ratio of devices and internet connections. The lowest access item was precisely the direct assessment of device and internet availability ($M = 3.14$). This helps explain why a high readiness rating can coexist with interview reports of limited or absent connectivity. The results therefore describe educators' perceptions of readiness-related practices more than an objective technology audit.

Teacher professional learning received one of the highest overall integration scores, particularly for interactive modules, online forums, mentoring, and examples of ICT use. Yet one-to-one ICT coaching and continuous evaluation were among the lowest items. The distinction suggests that schools may provide general exposure to ICT without an adequately institutionalized support system. Doculan (2019) similarly argued that infrastructure alone does not guarantee effective technology-supported learning; user readiness, support, and an enabling environment are also necessary. Sustained coaching and monitoring may therefore be more consequential than isolated training events.

The reported group differences were small. School heads rated organization and administration slightly higher, whereas teachers rated attitudes and perceptions slightly higher. These patterns are plausible because school heads may have greater visibility of administrative platforms and policy processes, while teachers interact more directly with learners' day-to-day engagement. Nevertheless, the $p = .050$ result is marginal, and the source contains inconsistent means across tables. These findings should be treated as provisional rather than as robust evidence of role-based differences.

The correlations show moderate positive relationships between ICT integration and both access technology and software integration. Schools with more favorable readiness assessments also tended to report stronger integration across curriculum, pedagogy, administration, professional learning, and tools. The R^2 values of .22-.31 suggest meaningful but incomplete overlap; other factors such as leadership, funding, technical support, teacher self-efficacy, learner access at home, and local infrastructure likely contribute. Because all measures were collected from the same respondents at one time, common-method effects and reciprocal relationships cannot be excluded. The findings do not show that readiness caused integration or that integration caused readiness.

The qualitative findings support a phased response rather than a technology-purchase-only strategy. Tomaro (2018) emphasized equitable government and institutional support for ICT in basic education, while Ertmer and Ottenbreit-Leftwich (2020) highlighted the importance of teacher beliefs, knowledge, and support. In Occidental Mindoro, procurement, connectivity, professional learning, access rules, maintenance, and monitoring should be addressed as a coordinated system. Without that coordination, devices may remain underused, software may become obsolete, and teachers may be unable to translate positive attitudes into consistent practice.

The most important editorial limitation is the internal inconsistency of the software-application findings and several related inferential tables. The software composite cannot be reconciled with its item scores from the manuscript alone. Likewise, some group means, verbal interpretations, and pairwise mean differences conflict across tables and narrative. The raw data and statistical output must be checked before the manuscript can be considered submission-ready.

3.3 Proposed ICT Integration Plan

The dissertation developed a plan intended to bridge the digital divide, strengthen digital literacy, improve teaching and learning, and prepare learners for future opportunities. For journal presentation, the long activity matrix is condensed into six implementation phases linked to the lowest-rated indicators and interview themes.

Table 6. Condensed six-phase ICT integration plan for public elementary schools

Phase	Priority actions	Lead and support groups	Suggested documentation
1. Assessment and planning	Inventory hardware, software, connectivity, accessibility, teacher competencies, and learner access; consult teachers, learners, parents, and community stakeholders.	School heads, teachers, ICT coordinators, district and division personnel.	Completed baseline inventory, documented needs, prioritized action plan.
2. Infrastructure development	Repair or replace outdated equipment; procure needed devices, projectors, licensed software, and connectivity; establish maintenance and technical-support arrangements; ensure accessibility.	School and division leadership, ICT coordinators, LGUs, service providers, NGOs, private partners.	Updated asset records, maintenance logs, documented connectivity and access arrangements.
3. Teacher training and support	Provide hands-on workshops, scenario-based training, mentoring, ICT coaching, online communities of practice, help-desk support, and follow-up sessions.	ICT coaches, experienced teachers, school heads, supervisors, resource persons.	Training participation, coaching records, teacher feedback, examples of classroom application.
4. Curriculum and pedagogy	Use real-world ICT assessments, blended and flipped learning, multimedia resources, virtual field trips, cloud collaboration, digital storytelling, and responsible social-media instruction.	Teachers, school heads, curriculum supervisors, ICT coordinators.	ICT-integrated lesson plans, learner outputs, assessment evidence, documented use of collaborative tools.

Phase	Priority actions	Lead and support groups	Suggested documentation
5. Community and partnerships	Orient parents and community members; develop partnerships with LGUs, NGOs, alumni, businesses, and technology providers; support equitable home and school access.	School heads, parents, community leaders, LGUs, NGOs, private sector.	Partnership agreements, resource contributions, participation records, access-support arrangements.
6. Monitoring and sustainability	Continuously evaluate ICT integration, gather stakeholder feedback, review infrastructure and training needs, maintain resources, and revise the plan based on evidence.	School heads, ICT coordinators, monitoring and evaluation personnel, division offices.	Periodic monitoring reports, updated inventories, feedback summaries, revised annual implementation plans.

Note. The dissertation identified School Maintenance and Other Operating Expenses, government support, LGUs, NGOs, alumni, parents, and private partners as possible funding sources.

3.4 Limitations

The study was limited to public elementary-school settings in the Division of Occidental Mindoro, so findings may not generalize to other divisions, private schools, urban systems, or better-resourced contexts. The cross-sectional design captured perceptions at one period and cannot establish temporal or causal relationships. Outcomes were based on school-head and teacher reports rather than direct observation, infrastructure audits, system-use logs, or learner performance data. The readiness measures often assessed educators' perceptions of learner-related practices rather than learners directly.

Instrument reliability, detailed validation evidence, response rate, statistical assumptions, and the method for pairwise variation tests were not reported. The qualitative component did not specify the composition of the 12 participants, transcription procedures, coding approach, or saturation. Finally, internal inconsistencies among item means, composite means, verbal interpretations, group-comparison means, and narrative conclusions limit the certainty of several findings. These limitations should be resolved or explicitly disclosed before publication.

4 Conclusion

School heads and teachers generally perceived ICT integration in public elementary schools in Occidental Mindoro as extensive, particularly for commonly used multimedia, virtual, administrative, and professional-learning practices. Access-related practices and attitudes were also rated favorably. However, the lowest survey indicators and interview accounts reveal persistent weaknesses in reliable devices and connectivity, infrastructure maintenance, individualized coaching, cloud-based collaboration, continuous evaluation, and ongoing learner support. Positive correlations indicate that stronger perceived access and software readiness accompany stronger ICT integration, but the cross-sectional data do not establish causality. A phased plan that integrates infrastructure, professional support, curriculum use, partnerships, and monitoring is warranted. The software-application and related inferential results require verification against the raw data before submission.

4.1 Recommendations

1. Validate the proposed ICT integration plan with school heads, teachers, ICT coordinators, division personnel, and community stakeholders before implementation.
2. Prioritize baseline infrastructure and connectivity audits, followed by maintenance, equitable access, and sustainable technical-support arrangements.
3. Institutionalize recurring, classroom-focused professional learning through mentoring, ICT coaching, communities of practice, and follow-up support rather than relying only on one-time training.
4. Pilot the plan in selected schools and monitor documented use, accessibility, teacher support, and implementation barriers before division-wide scaling.
5. Conduct future studies using direct learner measures, infrastructure audits, classroom observation, objective usage data, and additional variables such as teacher disposition and understanding of ICT in education.

5 References

Editorial note: The uploaded dissertation PDF ends after the recommendations and does not include its complete reference list. The entries below preserve only the author-year information and source descriptions available in the dissertation text. They are placeholders, not submission-ready references. Every entry must be replaced with a complete, verified bibliographic record in the target journal's style.

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