

The Effectiveness of the Information and Communication Technology (ICT) In Enhancing The 21st Century Skills of the Grade 6 Learners in the Public Elementary Schools in the Division of Camarines Sur

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ARTICLE INFORMATION	ABSTRACT
Article history: Published: October 2026	The study assessed Grade 6 teachers' information and communication technology (ICT) skills, perceived effectiveness of ICT for learners' 21st-century skills, barriers to integration, and proposed solutions in public elementary schools of the Division of Camarines Sur during school year 2025–2026. A descriptive–evaluative–correlational design surveyed 872 teachers selected from a listed population of 1,588 across five congressional districts. A researcher-developed, 195-item rating instrument was analyzed using weighted means and Kendall's coefficient of concordance (W). Internet and communication applications were the highest-rated ICT skill domain (4.56, Very Much Evident); productivity tools were lowest (4.13, Much Evident). Perceived effectiveness was highest for creativity and innovation (4.46) and lowest for problem-solving (3.98), both Much Effective. Limited access to technology was the most serious reported barrier (4.44). Additional devices, stable connectivity, and funding were each rated 5.00 as necessary solutions. Reported W values indicated concordant rankings across the five districts, but the ranking analyses used one fewer item per domain than the instrument specification, and no teacher-skill-to-learner-outcome association or direct learner assessment was reported. Findings describe teacher perceptions and priorities; they cannot establish that ICT enhanced learners' skills. The reliability calculation and ranking datasets require author verification.
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1. Introduction

Digital tools can support inquiry, communication, shared work, and the production of new ideas when their use is tied to an instructional purpose. Their availability alone cannot establish that learners have gained critical thinking, problem-solving, collaboration, or creativity. The distinction is particularly important in elementary schools, where access to devices, teachers' practical skills, and learners' prior experience can vary. The study examined teachers' ICT skills and ratings of its perceived effectiveness for Grade 6 learners in the public elementary schools of the Division of Camarines Sur.

The UNESCO ICT Competency Framework for Teachers identifies teacher preparation, pedagogical integration, and equitable access as related aspects of digital education (UNESCO, 2018). In the Philippines, the Department of Education's Policy Guidelines on the K to 12 Basic Education Program provide a curriculum context for relevant and learner-centered instruction (Department of Education [DepEd], 2019). These policy frames help explain why a local assessment should examine technical competence alongside lesson design and school resources. Neither document predicts the outcome of the present survey.

The study used "effectiveness" to label teachers' judgments about ICT-assisted development of five 21st-century skill areas. No independent learner assessments, exposure measures, comparison group, or pre–post observations were reported. Hence, effectiveness in the manuscript refers to perceived effectiveness, not a demonstrated instructional effect. The study also described itself as correlational, yet its reported inferential analyses concern agreement among district-level ranks. No correlation between teacher ICT skills and learner skills was presented. Clear separation of these constructs is necessary to avoid attributing the teachers' favorable ratings to verified improvement among pupils.

The research questions addressed: (1) teachers' ICT skill levels in basic operations, productivity tools, educational technology, and internet/communication applications; (2) agreement in district rank orders for those skills; (3) perceived effectiveness for critical thinking, problem-solving, communication, collaboration, and creativity/innovation; (4) agreement in the rank orders of those ratings; (5) challenges in ICT teaching; (6) proposed solutions; (7) rank agreement for challenges and solutions; and (8) an action plan. The manuscript presents the principal district summaries and concordance tests. It interprets the results as survey ratings, identifies analytic limitations, and treats the action plan as a proposal rather than an evaluated intervention.

2. Methods

2.1 Design and setting

The study described a descriptive–evaluative–correlational survey in five congressional districts of the Division of Camarines Sur for school year 2025–2026. Descriptive summaries characterized teachers' ICT competencies, perceptions of effectiveness, challenges, and preferred solutions. Kendall's W evaluated the agreement of district rank orders within each domain. Despite the design label, no respondent-level association between teachers' ICT skills and learner outcomes was reported. The study procedure

described proposal review, permission through schools division authorities, questionnaire validation, administration, retrieval, tabulation, and formulation of an action plan. Its activity chart spans August 2025 to July 2026, but exact survey dates were not specified.

2.2 Participants and sampling

The methods state that the five congressional districts were purposively selected as the locale and Grade 6 teachers were randomly sampled using Slovin's formula. The stated population was 1,588 teachers and the total selected sample was 872. The district subtotals, as printed, were 141, 171, 165, 210, and 185 respondents (Table 1). The report does not identify the sampling frame at school level, randomization procedure, response rate, formula margin of error, or treatment of nonresponse. District totals describe the achieved or designated sample; they do not by themselves demonstrate probability sampling.

Table 1. Grade 6 teacher population and reported sample by congressional district

District	Population	Sample	Reported %
1st	219	141	16
2nd	300	171	20
3rd	280	165	19
4th	445	210	24
5th	344	185	21
Grand Total	1,588	872	100

Note. Counts and percentages reproduce the respondents table; the percentages refer to the distribution of the 872 sampled teachers and are rounded.

The fourth district contributed the largest group (210, reported 24%), while the first contributed the smallest (141, reported 16%). Group size is relevant when describing respondent-level data, but the concordance analyses in the results appear to use the five district rankings as five judges or groups. Thus W does not treat all 872 individual teachers as independent judges. The survey sampled teachers, not Grade 6 pupils; no learner-level sample size or demographic distribution was supplied.

2.3 Instrument, validation, and data collection

A researcher-developed Likert-scale questionnaire contained 195 stated items in four parts. Part I allocated 48 items to four teacher ICT skill domains; Part II allocated 60 to five perceived-effectiveness domains; Part III allocated 70 to six challenge domains; and Part IV allocated 17 to solutions. Jurors from curriculum supervision, education program supervision, public schools district supervision, school leadership, and university faculty reviewed the questionnaire, followed by revision and adviser review. The number of jurors, pilot sample, item-level data, and subscale reliability coefficients were not given.

The skills scale labeled means of 4.50–5.00 Very Much Evident and 3.50–4.49 Much Evident. Perceived effectiveness used Very Much Effective and Much Effective for these ranges; challenges used Very Much Serious and Much Serious; solutions used Very Much Necessary and Much Necessary. Lower bands were 2.50–3.49, 1.50–2.49, and 1.00–1.49 with the corresponding lower labels. The methods report a reliability value of 0.79 using Kuder–Richardson Formula 21, together with a subsequent *t* value of 1.77. The scale is polytomous rather than dichotomous, and the printed formula and significance claim cannot be reproduced from the reported mean, standard deviation, and unspecified calculation *N*. The 0.79 is therefore a reported claim, not a verified reliability estimate. The questionnaire was distributed to selected Grade 6 teachers after permission and validation, then retrieved, tabulated, and interpreted. The report does not specify consent procedures, mode of administration, handling of unanswered items, or any direct classroom observations or tests administered to learners. Those matters should be documented from research records before submission; they are not inferred here.

2.4 Analysis

Frequency, percentage, weighted mean, and rank summarized responses. Kendall's *W* and its chi-square approximation were reported for district rank orders across items within each domain; the significance labels were $p < 0.001$. The inferential tables consistently list five groups. They list one fewer ranked item per domain than the questionnaire specification: for example, basic computer operations has thirteen allocated items but twelve analyzed cases, while the solution section has seventeen allocated items but sixteen analyzed cases. The manuscript reproduces *W* and chi-square statistics rather than constructing omitted item responses or recalculating tests. No correlation coefficient, regression model, effect size for learner skills, confidence interval, or missing-data analysis was presented.

3. Results

3.1 Teacher ICT skills

Table 2. Reported district-level summary of teacher ICT skill domains

District	Basic Computer Operations	Productivity Tools	Educational Technology Tools	Internet and Communication Applications
1st	4.57	4.06	4.29	4.50
2nd	4.50	4.11	4.28	4.55
3rd	4.41	4.16	4.34	4.59
4th	4.48	4.11	4.23	4.57
5th	4.55	4.16	4.38	4.61
Average	4.50	4.13	4.31	4.56

Note. Values are weighted means. Overall interpretation: Basic Computer Operations and Internet and Communication Applications = Very Much Evident; Productivity Tools (Word Processing, Spreadsheets, and Presentations) and Use of Educational Technology Tools = Much Evident. No four-domain mean is asserted here.

Internet and communication applications ranked first (4.56), followed by basic computer operations (4.50). Use of educational technology tools (4.31) and productivity tools (4.13) received lower ratings while remaining Much Evident. The ordering separates familiar access and communication functions from more demanding creation and integration tasks. It does not quantify how often an application was used in a lesson or how well it supported a learning objective. District means were relatively close, but a narrow range of rounded means does not establish equivalence of individual teachers' skills.

The basic-operations indicators ranged from the highly rated ability to turn a computer on, shut it down, and restart it (5.00) to troubleshooting simple frozen-screen or unresponsive-program problems (3.61). The contrast has practical importance: routine operation can be widespread even when independent recovery from a fault is less assured. The productivity-tool domain's relative position suggests that a training plan could examine document design, spreadsheets, and presentations rather than repeat elementary start-up procedures. Such content selection should be checked against actual tasks and available equipment.

Table 3. Reported Kendall concordance for teacher ICT skill indicators

Domain	Items in test	W	Reported χ^2	Reported result
Basic Computer Operations	12	0.87	47.85	p<0.001
Productivity Tools	11	0.85	42.50	p<0.001
Use of Educational Technology Tools	11	0.89	44.50	p<0.001
Internet and Communication Applications	10	0.89	40.05	p<0.001

Note. Each test lists five groups. Test item counts are one fewer than the corresponding 13, 12, 12, and 11 items assigned in the instrument specification. χ^2 and significance labels are reported values.

The four W values ranged from 0.85 to 0.89 and were reported significant at $p < 0.001$. Such concordance concerns similarity of the five district rank orderings of item means, not uniform competence among 872 teachers. Strong agreement in ordering can coexist with differences in average skill level. Because the final instrument lists one more item in each domain, the actual ranked set, exclusions, ties, and chi-square approximation need verification. The reported results can guide examination of common skill priorities but cannot substitute for a test of a teacher-skill-learner-outcome relationship.

3.2 Perceived effectiveness for 21st-century skills

Table 4. Reported perceived effectiveness of ICT for Grade 6 learners' 21st-century skills

District	Critical Thinking	Problem-Solving	Comm. Skills	Collaboration	Creativity and Innovation
1st	4.22	3.95	4.08	4.37	4.46
2nd	4.28	4.05	4.15	4.30	4.42
3rd	4.25	3.97	4.02	4.43	4.44
4th	4.23	3.99	4.14	4.37	4.46
5th	4.28	3.95	4.05	4.44	4.52
Average	4.25	3.98	4.09	4.38	4.46

Note. Comm. Skills = Communication Skills. Values are weighted means. The overall interpretation for every skill domain is Much Effective. "Effective" is the questionnaire label for teacher perception; no learner skill scores were provided.

All five perceived-effectiveness domains fell within Much Effective. Creativity and innovation was highest at 4.46, followed by collaboration at 4.38, critical thinking at 4.25, communication at 4.09, and problem-solving at 3.98. The 0.48 span between highest and lowest suggests teachers saw more opportunities for digital creation than for structured problem-solving. This comparison is descriptive and cannot establish that creative tasks actually improved learners' creativity more than problem tasks improved their reasoning. The small difference between the first three district means within a domain should likewise not be overread without distributions or uncertainty estimates.

A plausible instructional question follows from the relative position of problem-solving: do digital activities ask pupils to define a problem, consider evidence, test alternatives, and explain a solution, or do they mainly ask pupils to produce a digital artifact? The survey does not observe task design or score pupil work, so this is a direction for classroom review rather than a demonstrated explanation. Creativity at 4.46 remains just below the 4.50 threshold for the Very Much Effective category, underscoring that category labels are sensitive to a small difference in rounded means.

Table 5. Reported Kendall concordance for perceived-effectiveness indicators

Skill domain	Items in test	W	Reported χ^2	Reported result
Critical Thinking	12	0.94	51.70	p<0.001
Problem-Solving	11	0.89	44.50	p<0.001
Communication Skills	11	0.87	43.50	p<0.001
Collaboration	11	0.80	40.00	p<0.001
Creativity and Innovation	10	0.84	37.80	p<0.001

Note. Each test lists five groups. The table of specifications allocates 13, 12, 12, 12, and 11 items, respectively. Reported χ^2 values are reproduced without independent reanalysis.

Reported rank concordance was strongest for critical-thinking indicators ($W = 0.94$) and lowest for collaboration ($W = 0.80$); every domain was labeled significant at $p < 0.001$. These tests assess whether the five district-level item orderings are similar. They do not estimate the effect of ICT use on pupils' measured skills and do not show that individual respondents agreed. The one-item shortfall in each test remains unresolved. Verifying the instrument and reconstituting all five district rankings would show whether the reported W values correspond to the administered items.

3.3 Challenges in teaching ICT

Table 6. Reported severity of challenges encountered by teachers

Challenge	Average weighted mean	Interpretation	Rank
Limited Access to Technology	4.44	Much Serious	1
Budgetary Constraints	4.12	Much Serious	2
Technical Issues and Support	4.09	Much Serious	3
Inadequate Infrastructure	3.79	Much Serious	4.5
Lack of Learner Readiness	3.79	Much Serious	4.5
Lack of Training and Professional Development	3.76	Much Serious	6

Note. The ranking and means reproduce the challenge summary. “Much Serious” is the study’s scale label. The two domains at 3.79 share rank 4.5 in the printed summary.

Limited access to technology was the highest-rated barrier (4.44). Budgetary constraints (4.12) and technical issues/support (4.09) followed; training and professional development was lowest at 3.76, yet still classified Much Serious. The ordering supports a priority to document access conditions before assuming training alone is sufficient. It does not identify a specific number of missing devices, the availability or speed of connectivity, maintenance costs, or the source of funds. An equipment and usage audit would turn broad ratings into a decision-ready inventory.

Inadequate infrastructure and learner readiness both averaged 3.79, but they refer to different problems. Infrastructure includes power, networks, or facilities, whereas readiness concerns pupils’ prior experience and ability to use tools in learning tasks. Their common mean does not establish that a single intervention will address both. The study’s self-report format also makes it possible for respondents to rate overlapping resource and technical concerns as serious. The domains should be examined separately in any action plan.

Table 7. Reported Kendall concordance for challenge indicators

Challenge	W	Reported χ^2	Reported result
Limited Access to Technology	0.88	44.00	$p < 0.001$
Lack of Training and Professional Development	0.92	41.40	$p < 0.001$
Technical Issues and Support	0.94	47.00	$p < 0.001$
Inadequate Infrastructure	0.91	40.95	$p < 0.001$
Lack of Learner Readiness	0.49	24.50	$p < 0.001$
Budgetary Constraints	0.92	46.00	$p < 0.001$

Note. Five district groups were used. The challenge test item counts in the detailed statistical table are 11, 10, 11, 10, 11, and 11, one fewer than the instrument allocation in every domain. The χ^2 and p labels are reported, not recalculated.

Five challenge domains had reported W values from 0.88 to 0.94, while lack of learner readiness was lower at 0.49. All six were reported significant. The lower W indicates that district-level rankings of learner-readiness items were less concordant than rankings of the other barriers. That does not prove differences in average severity across districts or identify which district had a particular need. Item wording, ties, and district-specific ranks are needed to interpret the difference. The consistent one-item discrepancy also weakens reproducibility of the χ^2 calculations.

3.4 Proposed solutions and action plan

Table 8. Selected highest-rated solutions and overall concordance

Proposed solution or statistic	Reported value	Interpretation
Additional computers, tablets, or devices	5.00	Very Much Necessary
Stable internet and network infrastructure	5.00	Very Much Necessary
Funding through budgets, grants, or partnerships	5.00	Very Much Necessary
Regular ICT equipment maintenance	4.96	Very Much Necessary
Dedicated IT support team	4.92	Very Much Necessary
Upgrade outdated hardware and software	4.88	Very Much Necessary
Kendall W for proposed-solution rankings	0.91	Five groups, 16 items
Reported χ^2 for proposed-solution rankings	68.25	$p < 0.001$

Note. The first six values are item means reported for proposed solutions. The concordance test states five groups and sixteen items, although the instrument specification assigns seventeen solution items.

The three highest-rated solutions—more devices, stable connectivity, and funding—each received 5.00. Maintenance (4.96), dedicated technical support (4.92), and upgrades (4.88) were also rated Very Much Necessary. These ratings identify perceived priorities, not feasibility, cost effectiveness, or evidence that implementation would improve learning. The proposed rank order was reported highly concordant across districts ($W = 0.91$, $\chi^2 = 68.25$, $p < 0.001$), but the test covers sixteen rather than the seventeen solution items in the specification. A budgeted action plan should be based on verified inventory and implementation capacity.

The study formulated an action plan titled “Strengthening the Teachers’ ICT Skills to Enhance the 21st Century Skills of the Grade 6 Learners in the Public Elementary Schools in the Division of Camarines Sur” for school year 2026–2027. The plan was a proposed output of the survey. No execution, evaluation, or learner outcomes from that plan are reported. Its strongest empirical basis is the contrast between favorable basic ICT and communication ratings and higher reported constraints on access, funding, and technical support. The plan should specify responsibilities, resources, milestones, and observable outcomes before it is treated as an intervention.

4. Discussion

The first pair of findings distinguishes facility with routine digital functions from instructional use. Teachers rated internet and communication applications at 4.56 and basic computer operations at 4.50, whereas productivity and educational tools scored 4.13 and 4.31. UNESCO's teacher ICT framework treats professional digital competence as more than operating devices; it connects technology with curriculum, pedagogy, assessment, and professional learning (UNESCO, 2018). In this setting, the survey suggests that training could focus on preparing materials and designing tasks that make use of existing tools. It does not establish a deficit in the tested teacher population, because skill was self-reported rather than demonstrated.

The perceived learner-skill profile offers a complementary question for instructional design. Creativity and collaboration received the highest ratings, while problem-solving was relatively lower. A digital product can support creativity, but the intended learning should also be explicit: what question must a learner answer, what evidence should be examined, and how should an idea be revised or explained? The study collected no artifacts or standardized ratings of these performances. The results therefore justify examining lesson tasks, not claiming a causal link from teacher ICT skill to better learner outcomes. This distinction is consistent with the study's own measurement boundary.

The strong district rank concordance across ICT skills and perceived effectiveness should be read narrowly. *W* captures agreement in the order of indicators across five district summaries. It does not make the 872 teachers homogeneous, establish equivalent scores across districts, or quantify a relationship between the two constructs. In fact, a rank order can be similar when district mean levels differ. The results are also sensitive to the exact item sets and handling of tied ranks. Because every test omits one item relative to the specification, the ranking analyses should be audited before they are used to justify precise priorities.

Limited technology access was the most serious reported challenge despite favorable ratings for internet and communication skill. These two findings need not conflict: an individual can know how to use an application yet lack sufficient devices, time, reliable connectivity, or school technical support to employ it in every lesson. The questionnaire does not independently verify any of those resource conditions. The appropriate response is to measure them. A school-level inventory, maintenance log, and record of scheduled ICT lessons could show where access, setup, or support most constrains actual instruction.

Teachers' preference for devices, network capacity, and funding aligns with the access concern. Yet a score of 5.00 for a proposed solution should not be confused with an estimate of its impact. The original action plan for 2026–2027 may be made evaluable by pairing each action with a baseline, responsible unit, implementation record, and learner-level outcome. A first phase could examine the proportion of planned lessons delivered with functioning devices; another could review whether pupils complete tasks involving explanation, shared problem-solving, and revision. No such effects can be inferred from the current ratings.

The study's design imposes several limitations. Teacher respondents judged both their own ICT skills and the apparent effectiveness for learners, so common response style and expectations can influence both domains. Learners were not sampled or tested. No item-level distributions, response rates, or direct classroom observations are available. The claimed KR-21 reliability calculation is inappropriate for an ordinary multi-category Likert instrument without an explicit dichotomization scheme, and the subsequent significance assertion is internally unclear. The study calls its design correlational while reporting concordance rather than an association analysis. These features prevent a conclusion that teacher ICT skills enhanced Grade 6 learners' competencies.

External comparison must also be cautious. Nhleko, Aroba, and Chisita (2024) reviewed ICT and student motivation in higher education, a different outcome and population. Their synthesis shows why engagement is a plausible topic for research, but it cannot validate the present Grade 6 effectiveness ratings. The national K to 12 policy (DepEd, 2019) provides a context for learner-centered work, while local resource decisions need evidence from the Division's schools. The study contributes a broad descriptive map of teachers' perceptions; its strongest use is to formulate questions for more direct measurement.

A follow-up study could sample learner work within the same classrooms, document specific ICT-based lessons, and score problem-solving, communication, collaboration, and creativity using predefined rubrics. It should collect baseline and follow-up measures, preserve teacher and school identifiers for appropriate clustered analysis, and record resource access. This would allow examination of whether implementation and outcomes change together while remaining alert to selection and confounding. The current survey cannot answer those longitudinal questions, but its domain rankings help identify which outcomes and implementation conditions to measure first.

5. Conclusion

The study reports strong teacher ratings of internet and communication ICT skills (4.56) and relatively lower ratings of productivity tools (4.13). ICT was perceived as Much Effective for all five learner-skill domains, highest in creativity and innovation (4.46) and lowest in problem-solving (3.98). Limited access to technology (4.44) led the challenges, and devices, connectivity, and funding were the highest-rated solutions (each 5.00). Reported district rank concordance was significant across the presented domains, but the instrument-to-analysis item discrepancy and reliability calculation require correction. These findings support an auditable access and professional-development plan. They do not demonstrate a measured enhancement of learners' 21st-century skills.

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