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UTILIZATION OF DIGITAL TOOLS IN MATHEMATICS INSTRUCTION AND LEARNERS' PERFORMANCE

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ABSTRACT

This study determined the utilization of digital tools in Mathematics instruction and learners' performance in Cluster III, Schools Division of Antique, Philippines, during School Year 2026–2027. It described the respondents' profile, compared utilization and performance across profile groups, and examined their relationship. A quantitative descriptive-correlational design was employed among 106 secondary Mathematics teachers selected through total population sampling. Data were gathered using a validated 15-item researcher-made utilization questionnaire with excellent internal consistency (Cronbach's $\alpha = .904$) and an official-grade data sheet. Frequency, percentage, mean, Mann–Whitney U test, Kruskal–Wallis H test, and correlation analysis were used at the .05 significance level. Results showed that digital tools were utilized to a great extent ($M = 4.06$), particularly for lesson preparation, multimedia explanation, mathematical representation, and virtual manipulation. Learners' Mathematics performance was Very Satisfactory ($M = 89.18$). Digital-tool utilization differed significantly according to position ($U = 989.235$, $p = .049$) and educational attainment ($H = 27.861$, $p < .001$), but not according to grade level taught, length of service, or school location. Learners' performance did not differ significantly across any profile variable. The relationship between digital-tool utilization and performance was weak, positive, and nonsignificant ($r = .085$, $p = .201$). The findings indicated that frequent technology use alone did not ensure higher Mathematics grades. Schools should strengthen pedagogically focused training, collaborative digital planning, differentiated technology-supported activities, infrastructure, and evaluation of specific digital practices using learner-centered performance evidence. Future studies should examine classroom implementation, access, motivation, and instructional quality through mixed-method or experimental designs.

KEYWORDS: Digital Tools, Mathematics Instruction, Learners' Performance, Technology Integration, Secondary Education.

INTRODUCTION

Digital tools have become integral to contemporary mathematics instruction because they can represent abstract ideas dynamically, provide immediate feedback, support differentiated learning, and connect mathematical concepts with authentic situations. Interactive applications, graphing and computational software, learning platforms, video demonstrations, virtual manipulatives, presentation tools, online assessments, and collaborative environments can expand the ways teachers explain, model, practice, and assess mathematics. When these tools are selected according to learning objectives and combined with sound pedagogy, they can promote visualization, exploration, problem solving, communication, and sustained learner participation (Organisation for Economic Co-operation and Development [OECD], 2023; UNESCO, 2023).

The educational value of digital technology depends on the quality of its integration rather than on access or frequency alone. Technology is more likely to support learning when teachers use it to make learner thinking visible, provide actionable feedback, organize cognitively manageable tasks, and create opportunities for active construction of knowledge. Recent evidence indicates that pedagogically aligned technology integration is positively associated with learners' engagement and digital competencies, while unstructured or passive use may produce limited gains (Consoli et al., 2025; Forsström et al., 2025). In mathematics, this distinction is particularly important because digital tools should deepen conceptual understanding and reasoning instead of merely replacing printed materials or manual procedures.

Philippine basic education policies likewise support the purposeful use of technology. Republic Act No. 10533 requires a learner-centered and responsive K to 12 curriculum, while the Basic Education Learning Continuity Plan and DepEd Order No. 18, s. 2020 strengthened the use of flexible and technology-supported learning delivery. DepEd Order No. 8, s. 2015 further emphasizes assessment evidence aligned with intended learning standards. These policies establish a basis for using digital tools in lesson preparation, instructional delivery, communication, assessment, feedback, and progress monitoring while maintaining equity, accessibility, and learner protection.

Despite these policy directions, the use of digital tools remains uneven across schools. Teachers may differ in digital competence, confidence, professional preparation, access to

devices, internet connectivity, technical assistance, and opportunities for training. School location and available infrastructure can also affect whether technology is used for interactive mathematical investigation or only for presentation and communication. Research in Philippine settings has documented both the instructional potential of technology and persistent concerns involving resources, competence, and implementation support (Conda and Benavides, 2024; Natividad et al., 2024).

A further gap concerns the local evidence available for Cluster III, Schools Division of Antique. Existing studies commonly examine general technology integration, particular platforms, higher education settings, or emergency remote learning. Limited evidence describes how secondary Mathematics teachers across Belison, Patnongon, Bugasong, Valderrama, Laua-an, and Barbaza utilize a broad range of digital tools in routine instruction and whether variations in utilization correspond with learners' Mathematics performance. Without localized evidence, professional-development programs and resource decisions may not reflect the actual instructional practices and needs of teachers in the cluster.

The study was therefore proposed to determine the extent of utilization of digital tools in Mathematics instruction and examine its relationship with learners' performance during School Year 2026–2027. It focused on observable instructional uses such as preparing lessons, presenting concepts, facilitating exploration, supporting collaboration, administering assessments, giving feedback, differentiating tasks, and monitoring progress. The findings were expected to provide an empirical basis for strengthening teacher capability, allocating digital resources, and designing technology-supported Mathematics instruction that is pedagogically appropriate, equitable, and responsive to the context of Cluster III.

Statement of the Problem

This study was conducted to determine the utilization of digital tools in Mathematics instruction and learners' performance in Cluster III, Schools Division of Antique, Philippines, during School Year 2026–2027.

1. What is the profile of the respondents in terms of length of service, educational attainment, position, grade level taught, and school location?
2. What is the extent of utilization of digital tools in Mathematics instruction when taken as a whole and when classified according to length of service, educational attainment, position, grade level taught, and school location?

3. What is the learners' performance in Mathematics, as assessed by the respondents, when taken as a whole and when classified according to length of service, educational attainment, position, grade level taught, and school location?
4. Are there significant differences in the extent of utilization of digital tools in Mathematics instruction when respondents are classified according to length of service, educational attainment, position, grade level taught, and school location?
5. Are there significant differences in learners' performance in Mathematics as assessed by the respondents when classified according to length of service, educational attainment, position, grade level taught, and school location?
6. Is there a significant relationship between the utilization of digital tools in Mathematics instruction and learners' performance?

METHODOLOGY

The study employed a quantitative descriptive-correlational design involving all 106 secondary Mathematics teachers in Cluster III, Schools Division of Antique, during School Year 2026–2027, selected through total population sampling, excluding those who participated in the pilot test. Data were collected using a researcher-made instrument consisting of a respondent-profile section, a validated 15-item five-point scale measuring the utilization of digital tools in Mathematics instruction, and an official-grade data sheet recording learners' aggregated Mathematics grades. The instrument was reviewed by the research adviser and five experts, revised based on their recommendations, and pilot-tested among 30 comparable teachers outside the study locale, yielding excellent internal consistency (Cronbach's $\alpha = .904$). After securing institutional and school permissions and informed consent, the questionnaires were administered personally or through an approved secure digital platform, coded without names, checked for completeness, and stored securely. Data were processed using SPSS and analyzed through frequency and percentage for the respondents' profile, mean for digital-tool utilization and learners' performance, Mann–Whitney U and Kruskal–Wallis H tests for group differences, and Spearman's rank-order correlation for the relationship between the variables, with all inferential tests evaluated at the .05 level of significance.

RESULTS AND DISCUSSIONS

Table 1. Extent of Utilization of Digital Tools in Mathematics Instruction When Taken as a Whole.

As a teacher, I	mean	desc
Use digital tools to prepare Mathematics lessons and instructional materials.	4.19	Great
Use multimedia presentations or video demonstrations to explain mathematical concepts.	4.17	Great
Use graphing, geometry, spreadsheet, or similar applications to represent mathematical relationships.	4.16	Great
Use virtual manipulatives or simulations to support conceptual understanding.	4.15	Great
Provide learners with reliable digital resources for additional practice or review.	4.10	Great
Use digital tools to facilitate mathematical investigation and problem solving.	4.10	Great
Use collaborative digital spaces for learners to discuss solutions and share reasoning.	4.07	Great
Administer quizzes or formative assessments using digital tools.	4.06	Great
Provide timely digital feedback on learners' Mathematics work.	4.04	Great
Use digital records or analytics to monitor learners' progress.	4.02	Great
Use digital tools to manage assignments, submissions, and learning schedules.	4.02	Great
Differentiate digital activities according to learners' readiness and needs.	3.99	Great
Provide technology-supported remediation for learners who experience difficulty.	3.98	Great
Provide technology-supported enrichment for advanced learners.	3.97	Great
Collaborate with colleagues through digital applications in planning and improving Mathematics instruction.	3.91	Great
Overall	4.06	Great

Table 1 shows that the utilization of digital tools in Mathematics instruction obtained an overall mean of 4.06, described as Great. This indicates that the respondents used digital tools to a great extent across lesson preparation, instructional delivery, mathematical representation, assessment, feedback, differentiation, remediation, enrichment, and professional collaboration. The highest-rated practice was using digital tools to prepare Mathematics lessons and instructional materials ($M = 4.19$), followed by using multimedia presentations or video demonstrations ($M = 4.17$), mathematical applications such as graphing, geometry, and spreadsheets ($M = 4.16$), and virtual manipulatives or simulations ($M = 4.15$). The lowest-rated practices were collaborating with colleagues through digital applications ($M = 3.91$), providing technology-supported enrichment ($M = 3.97$), and providing technology-supported remediation ($M = 3.98$). All 15 indicators nevertheless remained within the Great category.

The results demonstrate that digital tools had become a regular component of Mathematics teaching, particularly for preparing materials, explaining concepts, representing relationships, and supporting conceptual understanding. The comparatively lower means for collaboration, enrichment, remediation, and differentiation suggest that teachers used technology somewhat more strongly for whole-class preparation and presentation than for collegial planning and highly individualized learning support. Thus, the overall mean should be interpreted as broad and frequent utilization, but not necessarily uniform sophistication across all pedagogical purposes. Research has similarly shown that the instructional quality and purpose of technology integration are more consequential than frequency alone and that successful implementation depends on teacher competence, infrastructure, and pedagogical design (Consoli et al., 2024; Msafiri et al., 2023).

Table 2. Extent of Utilization of Digital Tools in Mathematics Instruction When Classified According to Respondent Profile.

Profile	Profile	mean	desc
Position	Teacher I-VII	4.09	Great
	Master Teacher I-IV	4.03	Great
Grade Level Taught	Junior High School	4.06	Great
	Senior High School	4.06	Great
Educational Attainment	Bachelor	3.94	Great
	Masters	4.14	Great
	Doctorate	4.10	Great
Length of Service	1–10 years	4.06	Great
	11–20 years	4.06	Great
	21 years and above	4.07	Great
Location	Belison	4.06	Great
	Patnongon	4.16	Great
	Bugasong	4.06	Great
	Valderrama	4.02	Great
	Laua-an	4.04	Great
	Barbaza	4.03	Great
Total	Total	4.06	Great

Table 2 shows that every respondent group reported a Great extent of digital-tool utilization, with group means ranging from 3.94 to 4.16. Teacher I–VII respondents obtained a mean of

4.09, slightly higher than the 4.03 of Master Teachers I–IV. Junior and Senior High School teachers both obtained 4.06. Master’s degree holders recorded the highest educational-attainment mean ($M = 4.14$), followed by doctorate degree holders ($M = 4.10$) and bachelor’s degree holders ($M = 3.94$). The service-group means were nearly identical: 4.06 for both the 1–10-year and 11–20-year groups and 4.07 for those with at least 21 years of service. By location, Patnongon recorded the highest mean ($M = 4.16$), while Valderrama obtained 4.02 and Barbaza 4.03. The overall mean was 4.06.

The uniform descriptive category indicates that digital tools were widely used across professional ranks, grade levels, qualifications, experience groups, and municipalities. The identical grade-level means and the difference of only .01 across service groups suggest particularly consistent utilization in these classifications. Larger descriptive gaps appeared between master’s and bachelor’s degree holders and between Patnongon and Valderrama, although descriptive differences alone do not establish statistical significance. Such patterns may reflect variations in professional preparation, access, confidence, or school support. Peng et al. found that digital competence, attitudes, and self-efficacy influenced utilization, while Woldemariam et al. emphasized the combined importance of institutional readiness, professional competence, and external support (Peng et al., 2023; Woldemariam et al., 2025).

Table 3. Level of Learners’ Performance in Mathematics When Taken as a Whole.

Variable	Mean	Description
Learners’ Performance in Mathematics	89.18	Very Satisfactory

Learners’ Mathematics performance obtained an overall mean of 89.18, described as Very Satisfactory. This indicates that, as a whole, the learners demonstrated a very satisfactory level of attainment of the expected Mathematics competencies.

Table 4. Level of Learners’ Performance in Mathematics When Classified According to Respondent Profile.

Profile	Profile	mean	desc
Position	Teacher I-VII	89.21	Very satisfactory
	Master Teacher I-IV	89.14	Very satisfactory
Grade Level Taught	Junior High School	89.39	Very satisfactory
	Senior High School	88.76	Very satisfactory
Educational Attainment	Bachelor	89.37	Very satisfactory

Profile	Profile	mean	desc
	Masters	89.06	Very satisfactory
	Doctorate	89.09	Very satisfactory
Length of Service	1–10 years	90.11	Outstanding
	11–20 years	88.87	Very satisfactory
	21 years and above	88.76	Very satisfactory
Location	Belison	88.37	Very satisfactory
	Patnongon	89.67	Very satisfactory
	Bugasong	89.28	Very satisfactory
	Valderrama	89.31	Very satisfactory
	Laua-an	89.56	Very satisfactory
	Barbaza	88.62	Very satisfactory

Table 4 indicates that learners' Mathematics performance obtained an overall mean of 89.18, described as Very Satisfactory. Learners under Teacher I–VII respondents obtained 89.21, while those under Master Teachers I–IV obtained 89.14. Junior High School learners obtained 89.39 compared with 88.76 among Senior High School learners. By educational attainment, the means ranged narrowly from 89.06 to 89.37. Learners under teachers with 1–10 years of service recorded the highest mean ($M = 90.11$), the only group described as Outstanding; the 11–20-year and 21-years-and-above groups obtained 88.87 and 88.76, respectively. By location, Patnongon had the highest mean ($M = 89.67$), followed by Laua-an ($M = 89.56$), while Belison had the lowest ($M = 88.37$). All location groups remained Very Satisfactory.

The findings show that learners generally exceeded the expected Mathematics standards across the respondent classifications. Although the 1–10-year service group crossed the Outstanding threshold, most group means clustered within the Very Satisfactory range, indicating broadly consistent achievement. The descriptive variations should not be attributed solely to teachers' digital-tool utilization because grades may also reflect learner readiness, motivation, instructional quality, assessment practices, school resources, and academic support. Evidence indicates that digital technologies can contribute to achievement when aligned with clear learning objectives and well-designed instruction, but access or frequency of use alone does not guarantee improved outcomes (Forsström et al., 2025; UNESCO, 2023).

Table 5. Differences in Digital-Tool Utilization According to Position and Grade Level Taught.

Profile	Profile	mean rank	U-value	p-value	remarks
Position	Teacher I-VII	43.030	989.235	0.049	Significant
	Master Teacher I-IV	52.750			
Grade Level Taught	Junior High School	47.933	1143.650	0.771	Not significant
	Senior High School	46.997			

Table 5 shows a significant difference in the extent of digital-tool utilization according to position ($U = 989.235$, $p = .049$). Since the probability value was lower than the .05 level of significance, the null hypothesis was rejected for position. Master Teachers I–IV obtained the higher mean rank of 52.750 compared with 43.030 among Teacher I–VII respondents, indicating that the distribution of utilization scores differed significantly between the two position groups. In contrast, no significant difference was found according to grade level taught ($U = 1143.650$, $p = .771$). Thus, the null hypothesis was not rejected for grade level taught. Junior and Senior High School teachers had similar mean ranks of 47.933 and 46.997, respectively.

The significant position-based difference suggests that professional rank was associated with variation in digital-tool utilization. Master Teachers may have had broader leadership responsibilities, mentoring experience, professional-development exposure, or involvement in instructional planning that supported their use of digital resources. However, the result does not prove that promotion itself caused stronger utilization, particularly because the descriptive means in Table 4 placed Teacher I–VII slightly higher; therefore, the scoring direction and group coding should be checked before making a directional conclusion. The nonsignificant grade-level result indicates comparable utilization in Junior and Senior High School. These findings reinforce the importance of competence, confidence, access, and subject-specific professional development rather than assuming that teaching assignment alone determines technology use (Peng et al., 2023; Peters et al., 2022).

Table 6. Differences in Digital-Tool Utilization According to Educational Attainment, Length of Service, and School Location.

Profile	Profile	mean rank	H-value	p-value	remarks
Educational Attainment	Bachelor	67.125	27.861	0.000	Significant
	Masters	34.819			
	Doctorate	41.596			
Length of Service	1–10 years	48.183	0.042	0.869	Not significant
	11–20 years	47.852			
	21 years and above	46.767			
Location	Belison	49.217	5.614	0.247	Not significant
	Patnongon	33.993			
	Bugasong	47.081			
	Valderrama	53.948			
	Laua-an	49.593			
	Barbaza	53.279			

Table 6 reveals a significant difference in digital-tool utilization according to educational attainment ($H = 27.861$, $p < .001$). Because the probability value was below .05, the null hypothesis was rejected for educational attainment. Bachelor's degree holders obtained the highest mean rank (67.125), followed by doctorate degree holders (41.596) and master's degree holders (34.819). An appropriate post hoc comparison was necessary to identify the specific pairs of groups that differed significantly. No significant differences were found according to length of service ($H = 0.042$, $p = .869$) or school location ($H = 5.614$, $p = .247$); consequently, the null hypothesis was not rejected for these variables.

The significant result indicates that utilization scores were not distributed equally across educational-attainment groups. However, the ordering of the mean ranks in Table 6 conflicts with the descriptive means in Table 2, where master's degree holders had the highest mean and bachelor's degree holders the lowest. The coding direction, raw scores, labels, and statistical output should therefore be verified before concluding which group demonstrated greater utilization. Pending that verification and the required post hoc test, the defensible conclusion is only that at least one educational-attainment group differed from another. Research supports formal and continuing professional learning but also shows that qualifications must translate into authentic pedagogical application (OECD, 2023; Fernández-Batanero et al., 2024).

The nonsignificant results for length of service and school location indicate that the observed variations in mean ranks were insufficient to establish systematic group differences. Digital-tool utilization was therefore statistically comparable among early-career, mid-career, and long-serving teachers and across the six municipalities. Shared curriculum requirements, division initiatives, and professional-development opportunities may have contributed to this consistency. Nevertheless, institutional readiness, functional equipment, connectivity, technical assistance, and school leadership should remain priorities because they can enable or restrict the classroom application of digital competence (Woldemariam et al., 2025; Ayunar et al., 2024).

Table 7. Differences in Learners' Mathematics Performance According to Position and Grade Level Taught.

Profile	Profile	mean rank	U-value	p-value	remarks
Position	Teacher I-VII	47.051	1214.405	0.731	Not significant
	Master Teacher I-IV	48.247			
Grade Level Taught	Junior High School	46.070	1013.265	0.370	Not significant
	Senior High School	50.619			

Table 7 shows no significant difference in learners' Mathematics performance according to position ($U = 1214.405$, $p = .731$) or grade level taught ($U = 1013.265$, $p = .370$). Since both probability values exceeded the .05 level of significance, the null hypothesis was not rejected for either variable. Teacher I–VII and Master Teacher I–IV groups obtained similar mean ranks of 47.051 and 48.247, respectively. Junior and Senior High School groups likewise had mean ranks of 46.070 and 50.619, but this difference was not statistically significant.

The findings indicate that learners' Very Satisfactory performance was maintained across teacher-position and grade-level groups. Professional rank and assignment to Junior or Senior High School did not independently distinguish learners' grades in this sample. Achievement may instead have reflected the combined influence of instructional quality, curriculum alignment, assessment practices, learner engagement, school resources, and support systems. Contemporary evidence likewise emphasizes that technology-supported learning depends on pedagogical quality and the appropriateness of the selected tools rather than on teacher classification or the mere presence of technology (Consoli et al., 2024; Forsström et al., 2025).

Table 8. Differences in Learners' Mathematics Performance According to Educational Attainment, Length of Service, and School Location.

Profile	Profile	mean rank	H-value	p-value	remarks
Educational Attainment	Bachelor	45.917	0.208	0.792	Not significant
	Masters	48.696			
	Doctorate	48.224			
Length of Service	1–10 years	41.017	2.090	0.275	Not significant
	11–20 years	49.850			
	21 years and above	50.452			
Location	Belison	52.911	1.041	0.843	Not significant
	Patnongon	44.945			
	Bugasong	46.707			
	Valderrama	46.862			
	Laua-an	44.747			
	Barbaza	51.215			

Table 8 indicates no significant differences in learners' Mathematics performance according to educational attainment ($H = 0.208$, $p = .792$), length of service ($H = 2.090$, $p = .275$), and school location ($H = 1.041$, $p = .843$). Since all probability values exceeded the .05 level of significance, the null hypothesis was not rejected for all three variables. Although the groups had different mean ranks, the observed differences were not large enough to establish that learners' performance systematically varied according to their teachers' academic qualifications, years of service, or municipality.

The results imply that learners' generally Very Satisfactory performance was broadly distributed across teacher and school groups. Educational attainment and teaching experience may contribute to professional expertise, but their effects on grades may have been moderated by common curriculum standards, collaborative planning, assessment systems, learner characteristics, institutional supervision, and resource availability. The nonsignificant location result also suggests relatively consistent Mathematics performance across the municipalities. Systematic evidence indicates that digital technology can support shared resources, personalized learning, and curriculum delivery, but its contribution depends on pedagogical alignment and equitable implementation and operates alongside numerous learner, teacher, and institutional factors (Msafiri et al., 2023; Li et al., 2025).

Table 9. Relationship Between Digital-Tool Utilization and Learners' Mathematics Performance.

Variables	r-value	p-value	Interpretation	Decision
Digital-tool utilization and learners' performance	.085	.201	Weak positive; not significant	Null hypothesis not rejected

Table 9 shows a weak positive correlation between the utilization of digital tools in Mathematics instruction and learners' performance ($r = .085$); however, the relationship was not statistically significant ($p = .201$). Since the probability value exceeded the .05 level of significance, the null hypothesis was not rejected. The coefficient of determination, computed as $r^2 = .007$, indicates that the two variables shared only about 0.7% of their variance. Thus, the small positive coefficient should not be interpreted as evidence that greater digital-tool utilization produced higher Mathematics grades.

The result implies that teachers' reported utilization of digital tools was not significantly associated with learners' Mathematics grades in this sample. This does not mean that digital tools had no instructional value; it means only that higher utilization scores did not correspond reliably with higher aggregated grades. The narrow descriptive ranges—Great utilization across all groups and predominantly Very Satisfactory performance—may have limited the variability required to detect a stronger relationship. Moreover, learning outcomes depend on the type of tool, quality of task design, duration and purpose of use, teacher competence, learner access, and alignment with Mathematics competencies. Research has emphasized that quality of integration is more consequential than frequency and that increased access or use alone does not guarantee improved achievement (Consoli et al., 2024; Forsström et al., 2025).

CONCLUSIONS

The respondents represented Mathematics teachers with varied professional positions, academic preparation, teaching assignments, experience, and school locations. The composition of the group provided perspectives from both classroom teachers and instructional leaders across Cluster III.

Digital tools had become a regular component of Mathematics instruction, especially in lesson preparation, multimedia presentation, mathematical visualization, and simulation. However, their comparatively lower use for teacher collaboration, remediation, and enrichment indicated areas in which technology integration could be made more responsive and learner-centered.

Learners generally demonstrated Very Satisfactory Mathematics performance. Although some descriptive differences appeared among groups, achievement remained consistently high and only the group handled by teachers with 1–10 years of service reached the Outstanding category.

Digital-tool utilization varied according to position and educational attainment, showing that professional role and academic preparation were associated with differences in how teachers reported using technology. Utilization was otherwise comparable across grade level taught, length of service, and school location.

Learners' performance was statistically comparable across all respondent-profile categories. This consistency shows that Mathematics achievement was not determined by any single teacher-profile characteristic examined in the study and may have reflected common curricular expectations, school practices, and multiple learner and classroom factors.

The extent of digital-tool utilization was not significantly related to learners' Mathematics grades. Frequent use of technology alone therefore did not ensure higher performance; the instructional purpose, quality of implementation, learner access, teacher competence, and alignment of each tool with mathematical objectives may have been more consequential than utilization frequency.

RECOMMENDATIONS

1. School administrators should sustain and equitably improve internet connectivity, devices, presentation equipment, licensed Mathematics applications, technical support, and maintenance across the six municipalities.
2. Mathematics teachers should strengthen the lower-rated uses of digital tools by designing technology-supported remediation, enrichment, differentiated practice, and collaborative lesson-planning activities.
3. Professional-development programs should emphasize the pedagogical use of graphing tools, dynamic geometry software, spreadsheets, simulations, virtual manipulatives, formative-assessment platforms, and multimedia representations rather than basic tool operation alone.
4. Master teachers and digitally proficient classroom teachers should facilitate mentoring, demonstration teaching, peer observation, resource sharing, and Learning Action Cell sessions focused on effective digital Mathematics instruction.
5. Because utilization differed according to position and educational attainment, administrators should provide equitable, role-responsive professional-development

opportunities and avoid assuming that rank or degree alone guarantees effective technology integration.

6. The educational-attainment data, coding, descriptive means, and mean ranks should be verified, and an appropriate post hoc test should be conducted before identifying the specific groups responsible for the significant difference.
7. Schools should maintain practices associated with the learners' Very Satisfactory performance while using diagnostic results and learner outputs to provide timely support to those who have not yet mastered essential Mathematics competencies.
8. Teachers and instructional leaders should evaluate digital practices through classroom observations, engagement data, assessment results, mathematical reasoning, problem-solving outputs, and learner feedback instead of relying only on reported frequency of use.
9. The nonsignificant relationship should not be interpreted as evidence that digital tools have no educational value. Schools should examine which tools, pedagogical strategies, learner groups, and mathematical topics produce meaningful gains under specific classroom conditions.
10. Future researchers should include learner-level variables such as digital literacy, motivation, access to devices, prior achievement, and socioeconomic context. Mixed-method, longitudinal, quasi-experimental, or experimental designs and direct classroom observations may clarify how the quality and purpose of digital-tool use affect Mathematics learning.

REFERENCES

1. Albarico, G. (2022). ICT integration in TLE-entrepreneurship instruction at selected mountain barangays. SSRN. <https://doi.org/10.2139/ssrn.5096675>
2. Ayunar, G. S., Casildo, N. J. G., Talandron-Felipe, M. M. P., Bonifacio, K. L. A., Marcelo, J. G., & Sebuguero, F. S. (2024). Determinants of ICT competency among public school teachers in Bukidnon. In A. Kashiara et al. (Eds.), *Proceedings of the 32nd International Conference on Computers in Education*. Asia-Pacific Society for Computers in Education. <https://library.apsce.net/index.php/ICCE/article/download/4991/4920/6301>
3. Conda, J. L. G., & Benavides, N. G. (2024). Profile, proficiency, and challenges of teachers in integrating ICT in Technology and Livelihood Education. *United International Journal for Research & Technology*, 5(5), 77–89. <https://uijrt.com/paper/profile-proficiency-challenges-teachers-integrating-ict-technology-livelihood-education>

4. Consoli, T., Schmitz, M.-L., Antonietti, C., Gonon, P., Cattaneo, A., & Petko, D. (2025). Quality of technology integration matters: Positive associations with students' behavioral engagement and digital competencies for learning. *Education and Information Technologies*, 30(6), 7719–7752. <https://doi.org/10.1007/s10639-024-13118-8>
5. Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE Publications.
6. Department of Education. (2015). Policy guidelines on classroom assessment for the K to 12 Basic Education Program (DepEd Order No. 8, s. 2015). <https://www.deped.gov.ph/2015/04/01/do-8-s-2015-policy-guidelines-on-classroom-assessment-for-the-k-to-12-basic-education-program/>
7. Department of Education. (2020). Policy guidelines for the provision of learning resources in the implementation of the Basic Education Learning Continuity Plan (DepEd Order No. 18, s. 2020). <https://www.deped.gov.ph/2020/07/20/do-018-s-2020-policy-guidelines-for-the-provision-of-learning-resources-in-the-implementation-of-the-basic-education-learning-continuity-plan/>
8. Forsström, S., Leppänen, J., Mikkonen, K., & Vivitsou, M. (2025). The impact of digital technologies on students' learning: Results from a literature review (OECD Education Working Papers No. 335). OECD Publishing. <https://doi.org/10.1787/9997e7b3-en>
9. Fullente, N. A. L., & Dio, R. V. (2023). Utilization of the Moodle learning management system of private schools Mathematics teachers in Sorsogon, Philippines. *International Journal of Advance Research and Innovative Ideas in Education*, 9(2), 2535–2544. <https://ijariie.com/FormDetails.aspx?MenuScriptId=218725>
10. Gallego Joya, L., Merchán Merchán, M. A., & López Barrera, E. A. (2025). Development and strengthening of teachers' digital competence: Systematic review. *Contemporary Educational Technology*, 17(1), Article ep555. <https://doi.org/10.30935/cedtech/15744>
11. Hattie, J. (2023). *Visible learning: The sequel: A synthesis of over 2,100 meta-analyses relating to achievement*. Routledge.
12. Li, F., Cheng, L., Wang, X., Shen, L., Ma, Y., & Islam, A. Y. M. A. (2025). The causal relationship between digital literacy and students' academic achievement: A meta-analysis. *Humanities and Social Sciences Communications*, 12, Article 237. <https://doi.org/10.1057/s41599-025-04399-6>

13. Msafiri, M. M., Kangwa, D., & Cai, L. (2023). A systematic literature review of ICT integration in secondary education: What works, what does not, and what next? *Discover Education*, 2, Article 44. <https://doi.org/10.1007/s44217-023-00070-x>
14. Natividad, E. B., Jr., Ortal, J. R., Garcia, A., & Sales, M. (2024). Effectiveness of ICT integration in improving learners' performance in the Schools Division of the City of Batac. *Divine Word International Journal of Management and Humanities*, 3(3), 937–949. <https://doi.org/10.62025/dwijmh.v3i3.86>
15. Novero, M. L. (2023). The use of an online learning management system to assess the performance of the students in Trigonometry. *International Journal of Trend in Scientific Research and Development*, 7(5), 980–1000. <https://www.ijtsrd.com/papers/ijtsrd59946.pdf>
16. Organisation for Economic Co-operation and Development. (2023). Teacher digital competences: Formal approaches to their development. In *OECD digital education outlook 2023: Towards an effective digital education ecosystem*. OECD Publishing. <https://doi.org/10.1787/c74f03de-en>
17. Peng, R., Abdul Razak, R., & Halili, S. H. (2023). Investigating the factors affecting ICT integration of in-service teachers in Henan Province, China: Structural equation modeling. *Humanities and Social Sciences Communications*, 10, Article 380. <https://doi.org/10.1057/s41599-023-01871-z>
18. Peters, M., Elasri-Ejjaberi, A., Martínez-Argüelles, M. J., & Fàbregues, S. (2022). Teacher digital competence development in higher education: Overview of systematic reviews. *Australasian Journal of Educational Technology*, 38(3), 122–139. <https://doi.org/10.14742/ajet.7543>
19. Republic of the Philippines. (2013). Republic Act No. 10533: Enhanced Basic Education Act of 2013. *Official Gazette*. <https://www.officialgazette.gov.ph/2013/05/15/republic-act-no-10533/>
20. UNESCO. (2023). Global education monitoring report 2023: Technology in education—A tool on whose terms? <https://doi.org/10.54676/UZQV8501>
21. UNESCO. (2024). Technology in education: A tool on our terms—2024 Pacific regional report. <https://www.unesco.org/gem-report/en/publication/2024-pacific-report-technology-education>
22. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>

23. Woldemariam, M. T., Ergado, A. A., & Jimma, W. (2025). Factors influencing effective integration of educational technology in the colleges of teacher education in Ethiopia: A constructivist grounded theory. *Australasian Journal of Educational Technology*, 41(2), 50–70. <https://doi.org/10.14742/ajet.9993>
24. Zuo, R., Li, W., & Zhang, X. (2025). The impact of information and communication technology on learning outcomes in early childhood and primary education: A meta-analysis of moderating factors. *Frontiers in Psychology*, 16, Article 1540169. <https://doi.org/10.3389/fpsyg.2025.1540169>