



TEACHERS' STRATEGIES AND EFFECTIVENESS OF DIGITAL TOOLS IN TEACHING MATHEMATICS

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ABSTRACT :

This study determined the teachers' strategies and effectiveness of digital tools in teaching mathematics in the District of Caluya, Schools Division of Antique, Philippines for School Year 2025–2026. It was conducted from March to April 2026 and involved all 202 public elementary school teachers in the district. Data were gathered using two validated questionnaires: one on teachers' strategies in teaching mathematics adapted from Ganai and Guiab (2023) and another on the effectiveness of digital tools based on Aljas, Suana, and Saldivar (2025), both validated by a panel of five experts. The study employed a descriptive-correlational research design. The independent variables included educational attainment, position, length of teaching experience, school size, and internet connectivity, while the dependent variables were teachers' strategies and effectiveness of digital tools in teaching mathematics. Data were analyzed using frequency, percentage, and mean for descriptive statistics, and Mann-Whitney U Test, Kruskal-Wallis H Test, and Spearman's rho at .05 level of significance for inferential statistics, processed through SPSS. Findings revealed that teachers mostly employed strategies were building on learners' prior knowledge, encouraging mathematical discussions, and facilitating tasks that promote explanation of reasoning. The level of effectiveness of digital tools in teaching mathematics was "Very High" when respondents were taken as a whole and across all classified variables. Significant differences were found in teachers' strategies and in the level of effectiveness of digital tools when respondents were grouped according to the identified demographic and professional variables. Moreover, a significant relationship was found between teachers' strategies and effectiveness of digital tools in teaching mathematics.

Keywords: teachers' strategies, effectiveness, digital tools, mathematics

INTRODUCTION

In recent years, the integration of digital tools in mathematics education has gained substantial attention from researchers and educators due to its potential to enhance learner learning and engagement. Studies show that digital tools—such as online learning modules, interactive applications, and multimedia presentations—can transform traditional mathematics instruction by making abstract mathematical concepts more accessible and engaging for learners (Saat et al., 2024).

Teacher strategies play a crucial role in determining how effectively digital tools are used in the classroom. Effective strategies involve aligning digital resources with sound pedagogical practices, differentiating instruction, and actively engaging learners in mathematical problem solving. Research has highlighted that teachers' strategies, such as using learner-centered approaches and visual tools, significantly influence the integration of digital technologies and learner outcomes in mathematics learning (Alegre, 2025). However, factors such as teachers' preparedness, infrastructure challenges, and digital proficiency continue to shape their ability to implement these strategies meaningfully and consistently (Yulin & Danso, 2025).

Locally, in the District of Caluya, Schools Division of Antique, teachers have also begun exploring digital tools to supplement their mathematics instruction, particularly in response to challenges brought about by blended and flexible learning arrangements. In many elementary schools across Caluya, teachers report varying access to devices, internet connectivity, and digital learning platforms, affecting how digital tools are utilized during mathematics lessons. Despite these constraints, some teachers have adopted mobile applications and interactive content through platforms to engage learners and provide differentiated support aligned with curriculum standards. These situational realities highlight the interplay between district-level resource availability and teachers' strategies, suggesting that the context of Caluya mirrors broader issues in under-resourced settings while also presenting opportunities for context-specific innovation and professional collaboration.

Given the evolving educational landscape and persistent challenges in mathematics learning, conducting this study is imperative to investigate how teachers' strategies and the effectiveness of digital tools interact to influence learner learning outcomes.

Statement of the Problem

This study aimed to determine the teachers' strategies and effectiveness of digital tools in teaching mathematics in the District of Caluya, Schools Division of Antique, Philippines for school year 2025-2026.

Specifically, this study sought answers to the following questions:

1. What are the teachers' strategies in teaching Mathematics when taken as a whole and when classified according to educational attainment, position, length of teaching experience, school size, and internet connectivity?
2. What is the level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when taken as a whole and when classified according to educational attainment, position, length of teaching experience, school size, and internet connectivity?
3. Are there significant differences in the teachers' strategies in teaching Mathematics when classified according to educational attainment, position, length of teaching experience, school size, and internet connectivity?
4. Are there significant differences in the level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when classified according to educational attainment, position, length of teaching experience, school size, and internet connectivity?
5. Is there significant relationship between teachers' strategies and effectiveness of digital tools in teaching mathematics?

Hypotheses

Based on the foregoing problems, the following hypotheses will be advanced:

1. There are no significant differences in the teachers' strategies in teaching Mathematics when classified according to educational attainment, position, length of teaching experience, school size, and internet connectivity.
2. There are no significant differences in the level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when classified according to educational attainment, position, length of teaching experience, school size, and internet connectivity.
3. There is no significant relationship between teachers' strategies and effectiveness of digital tools in teaching mathematics.

METHODS

This study used a descriptive-correlational research design to determine the teachers' strategies and effectiveness of digital tools in teaching mathematics in the District of Caluya, Schools Division of Antique, Philippines for school year 2025-2026.

A *descriptive-correlational research design* is a non-experimental quantitative approach that systematically describes the current status of variables and simultaneously examines the relationships between them without manipulating or intervening in the research setting. According to educational research methodology authorities, this design enables researchers to accurately portray existing conditions ("what," "when," and "how") and to assess the strength and direction of associations among variables using statistical tools such as Pearson's correlation (NIJSE, 2024; EPRA Journals, 2024). Creswell and Creswell (2023) and similar methodological sources emphasize that descriptive-correlational design is particularly useful in educational studies where variables cannot be ethically or practically manipulated, allowing researchers to draw insights into patterns and relationships that occur naturally within a population. Furthermore, this research design provides valuable evidence for educational planning and intervention development by highlighting trends and associations that may inform professional practices, policy decisions, or further experimental research (NIJSE, 2024; EPRA Journals, 2024).

This design was best suited for this study which intends to determine the relationship between teachers' strategies and effectiveness of digital tools in teaching mathematics as dependent variables in relation to educational attainment, position, length of teaching experience, school size and internet connectivity as independent variables.

RESULTS AND DISCUSSIONS

Teachers' Strategies in Teaching Mathematics When Taken as a Whole

The teachers' strategies in teaching mathematics when taken as a whole were determined by computing the mean scores.

When taken as a whole, the mostly employed teachers' strategies in teaching mathematics are the following: Building on learners' prior knowledge when introducing new mathematical concepts ($M=2.72$), Encouraging learners to engage in discussions that deepen their understanding of mathematics ($M=2.72$) and Facilitating tasks that encourage learners to explain their thinking and reasoning ($M=2.72$).

This result means that all teachers use the methods, techniques and procedures to help learners learn in Mathematics. This is indicated by building on learners' prior knowledge when introducing new mathematical concepts, encouraging learners to engage in discussions that deepen their understanding of mathematics and facilitating tasks that encourage learners to explain their thinking and reasoning.

This is consistent with the findings of Felisilda (2025) who found that inquiry-based strategies were predominantly used, leading to higher student research skills, particularly in problem conceptualization and reporting, revealing significant positive effects of strategic teaching on student outcomes.

Likewise, it affirms the findings of Chaudhuri (2024) that educators adopted a spectrum of approaches—ranging from traditional presentation formats to more inquiry-based and interactive methods—to sustain student learning.

Table 1 presents the data.

Table 1. Teachers' Strategies in Teaching Mathematics When Taken as a Whole

Teachers' Strategies in Teaching Mathematics	Mean	Description
Using learner-centered activities (e.g., group work, problem solving) in mathematics lessons.	2.67	Mostly Employed
Providing timely and constructive feedback to learners to help them improve their learning.	2.67	Mostly Employed
Building on learners' prior knowledge when introducing new mathematical concepts.	2.72	Mostly Employed
Encouraging learners to engage in discussions that deepen their understanding of mathematics.	2.72	Mostly Employed
Using collaborative learning strategies where learners work together to solve problems.	2.67	Mostly Employed
Modifying instructional strategies to meet the diverse needs of learners in mathematics.	2.64	Mostly Employed
Designing activities that actively involve learners in learning mathematical concepts.	2.64	Mostly Employed
Using questioning techniques that promote higher-order thinking.	2.64	Mostly Employed
Integrating real-world examples to make lessons more relevant and meaningful.	2.68	Mostly Employed
Monitoring learner progress during lessons and adjust teaching strategies accordingly.	2.65	Mostly Employed
Facilitating tasks that encourage learners to explain their thinking and reasoning.	2.72	Mostly Employed
Helping learners set clear learning goals in mathematics at the beginning of lessons.	2.61	Mostly Employed
Incorporating technology to support interactive learning in mathematics.	2.54	Mostly Employed
Using scaffolded tasks that gradually increase in complexity to support learner learning.	2.71	Mostly Employed
Reflecting on teaching strategies after lessons to improve future instruction.	2.67	Mostly Employed
Overall Mean	2.67	Mostly Employed

Scale of Means: 2.34–3.00 Mostly Employed; 1.67 – 2.33 Employed; 1.00 – 1.66 Least Employed

Teachers' Strategies in Teaching Mathematics When Classified According to Educational Attainment, Position, Length of Teaching Experience, School Size and Internet Connectivity

The teachers' strategies in teaching mathematics when classified according to educational attainment, position, length of teaching experience, school size, and internet connectivity were determined by computing the mean scores.

Educational Attainment. When classified according to highest educational attainment, the mostly employed strategies in teaching mathematics of teachers who are bachelor's degree holders are the following: Building on learners' prior knowledge when introducing new mathematical concepts (M=2.80), Encouraging learners to engage in discussions that deepen their understanding of mathematics (M=2.75) and Facilitating tasks that encourage learners to explain their thinking and reasoning (M=2.75).

On the other hand, the mostly employed strategies in teaching mathematics of teachers who are master's degree holders are the following: Building on learners' prior knowledge when introducing new mathematical concepts (M=2.88), Encouraging learners to engage in discussions that deepen their understanding of mathematics (M=2.85) and Facilitating tasks that encourage learners to explain their thinking and reasoning (M=2.84).

The above findings indicate that regardless of educational attainment, all teachers use the methods, techniques and procedures to help learners learn in Mathematics.

This finding supports the findings of *Salavacion, Satojito, and Martir (2025)* who found that teachers consistently applied innovative strategies across demographics.

Table 2 shows the data.

Table 2. Teachers' Strategies in Teaching Mathematics When Classified According to Educational Attainment

Teachers' Strategies	EDUCATIONAL ATTAINMENT			
	Bachelor's Degree		Master's Degree	
	Mean	Description	Mean	Description
Using learner-centered activities (e.g., group work, problem solving) in mathematics lessons.	2.66	Mostly Employed	2.83	Mostly Employed
Providing timely and constructive feedback to learners to help them improve their learning.	2.60	Mostly Employed	2.78	Mostly Employed
Building on learners' prior knowledge when introducing new mathematical concepts.	2.80	Mostly Employed	2.88	Mostly Employed
Encouraging learners to engage in discussions that deepen their understanding of mathematics.	2.75	Mostly Employed	2.85	Mostly Employed
Using collaborative learning strategies where learners work together to solve problems.	2.68	Mostly Employed	2.78	Mostly Employed
Modifying instructional strategies to meet the diverse needs of learners in mathematics.	2.58	Mostly Employed	2.81	Mostly Employed
Designing activities that actively involve learners in learning mathematical concepts.	2.56	Mostly Employed	2.76	Mostly Employed
Using questioning techniques that promote higher-order thinking.	2.55	Mostly Employed	2.77	Mostly Employed
Integrating real-world examples to make lessons more relevant and meaningful.	2.53	Mostly Employed	2.81	Mostly Employed
Monitoring learner progress during lessons and adjust teaching strategies accordingly.	2.62	Mostly Employed	2.77	Mostly Employed
Facilitating tasks that encourage learners to explain their thinking and reasoning.	2.75	Mostly Employed	2.84	Mostly Employed
Helping learners set clear learning goals in mathematics at the beginning of lessons.	2.65	Mostly Employed	2.83	Mostly Employed
Incorporating technology to support interactive learning in mathematics.	2.50	Mostly Employed	2.76	Mostly Employed
Using scaffolded tasks that gradually increase in complexity to support learner learning.	2.39	Mostly Employed	2.77	Mostly Employed
Reflecting on teaching strategies after lessons to improve future instruction.	2.64	Mostly Employed	2.83	Mostly Employed

Scale of Means: 2.34–3.00 Mostly Employed; 1.67 – 2.33 Employed; 1.00 – 1.66 Least Employed

Position. When classified according to position, the mostly employed strategies in teaching mathematics of teachers who are occupying the position of Teacher I-III are the following: Building on learners' prior knowledge when introducing new mathematical concepts ($M=2.84$), Encouraging learners to engage in discussions that deepen their understanding of mathematics ($M=2.73$) and Facilitating tasks that encourage learners to explain their thinking and reasoning ($M=2.73$).

On the other hand, the mostly employed strategies in teaching mathematics of teachers who are occupying the position of Master Teacher I-II are the following: Building on learners' prior knowledge when introducing new mathematical concepts ($M=2.91$), Encouraging learners to engage in discussions that deepen their understanding of mathematics ($M=2.88$) and Facilitating tasks that encourage learners to explain their thinking and reasoning ($M=2.87$).

The above findings indicate that both teachers occupying the position of Teacher I-III and Master Teacher I-II use the methods, techniques and procedures to help learners learn in Mathematics.

This affirms the findings of *Salavacion, Satojito, and Martir (2025)* who found that teachers consistently applied innovative strategies across demographics.

Table 3 shows the data.

Table 3. Teachers' Strategies in Teaching Mathematics When Classified According to Position

Teachers' Strategies	POSITION			
	Teacher I-III		Master Teacher I-II	
	Mean	Description	Mean	Description
Using learner-centered activities (e.g., group work, problem solving) in mathematics lessons.	2.72	Mostly Employed	2.77	Mostly Employed
Providing timely and constructive feedback to learners to help them improve their learning.	2.66	Mostly Employed	2.77	Mostly Employed
Building on learners' prior knowledge when introducing new mathematical concepts.	2.84	Mostly Employed	2.91	Mostly Employed
Encouraging learners to engage in discussions that deepen their understanding of mathematics.	2.73	Mostly Employed	2.88	Mostly Employed

Using collaborative learning strategies where learners work together to solve problems.	2.69	Mostly Employed	2.55	Mostly Employed
Modifying instructional strategies to meet the diverse needs of learners in mathematics.	2.64	Mostly Employed	2.91	Mostly Employed
Designing activities that actively involve learners in learning mathematical concepts.	2.64	Mostly Employed	2.64	Mostly Employed
Using questioning techniques that promote higher-order thinking.	2.63	Mostly Employed	2.77	Mostly Employed
Integrating real-world examples to make lessons more relevant and meaningful.	2.64	Mostly Employed	2.64	Mostly Employed
Monitoring learner progress during lessons and adjust teaching strategies accordingly.	2.66	Mostly Employed	2.86	Mostly Employed
Facilitating tasks that encourage learners to explain their thinking and reasoning.	2.73	Mostly Employed	2.87	Mostly Employed
Helping learners set clear learning goals in mathematics at the beginning of lessons.	2.71	Mostly Employed	2.86	Mostly Employed
Incorporating technology to support interactive learning in mathematics.	2.59	Mostly Employed	2.73	Mostly Employed
Using scaffolded tasks that gradually increase in complexity to support learner learning.	2.53	Mostly Employed	2.64	Mostly Employed
Reflecting on teaching strategies after lessons to improve future instruction.	2.71	Mostly Employed	2.77	Mostly Employed

Scale of Means: 2.34–3.00 Mostly Employed; 1.67–2.33 Employed; 1.00–1.66 Least Employed

Length of Teaching Experience. When classified according to length of teaching experience, the mostly employed strategies in teaching mathematics of teachers with short years of teaching experience are the following: Building on learners' prior knowledge when introducing new mathematical concepts ($M=2.85$), Encouraging learners to engage in discussions that deepen their understanding of mathematics ($M=2.83$) and Facilitating tasks that encourage learners to explain their thinking and reasoning ($M=2.84$).

On the other hand, the mostly employed strategies in teaching mathematics of teachers with long years of teaching experience are the following: Building on learners' prior knowledge when introducing new mathematical concepts ($M=2.81$), Encouraging learners to engage in discussions that deepen their understanding of mathematics ($M=2.75$) and Facilitating tasks that encourage learners to explain their thinking and reasoning ($M=2.73$).

The above findings indicate that both teachers with short and long years of teaching experience use the methods, techniques and procedures to help learners learn in Mathematics.

This corroborates the findings of *Salavacion, Satojito, and Martir (2025)* who found that teachers consistently applied innovative strategies across demographics.

Table 4 shows the data.

Table 4. Teachers' Strategies in Teaching Mathematics When Classified According to Length of Teaching Experience

Teachers' Strategies	LENGTH OF TEACHING EXPERIENCE			
	Short		Long	
	Mean	Description	Mean	Description
Using learner-centered activities (e.g., group work, problem solving) in mathematics lessons.	2.81	Mostly Employed	2.65	Mostly Employed
Providing timely and constructive feedback to learners to help them improve their learning.	2.75	Mostly Employed	2.61	Mostly Employed
Building on learners' prior knowledge when introducing new mathematical concepts.	2.85	Mostly Employed	2.81	Mostly Employed
Encouraging learners to engage in discussions that deepen their understanding of mathematics.	2.84	Mostly Employed	2.75	Mostly Employed
Using collaborative learning strategies where learners work together to solve problems.	2.78	Mostly Employed	2.67	Mostly Employed
Modifying instructional strategies to meet the diverse needs of learners in mathematics.	2.76	Mostly Employed	2.60	Mostly Employed
Designing activities that actively involve learners in learning mathematical concepts.	2.67	Mostly Employed	2.62	Mostly Employed
Using questioning techniques that promote higher-order thinking.	2.67	Mostly Employed	2.62	Mostly Employed
Integrating real-world examples to make lessons more relevant and meaningful.	2.69	Mostly Employed	2.60	Mostly Employed
Monitoring learner progress during lessons and adjust teaching strategies accordingly.	2.69	Mostly Employed	2.67	Mostly Employed
Facilitating tasks that encourage learners to explain their thinking and reasoning.	2.83	Mostly Employed	2.73	Mostly Employed
Helping learners set clear learning goals in mathematics at the beginning of lessons.	2.79	Mostly Employed	2.66	Mostly Employed

Incorporating technology to support interactive learning in mathematics.	2.67	Mostly Employed	2.55	Mostly Employed
Using scaffolded tasks that gradually increase in complexity to support learner learning.	2.71	Mostly Employed	2.40	Mostly Employed
Reflecting on teaching strategies after lessons to improve future instruction.	2.74	Mostly Employed	2.70	Mostly Employed

Scale of Means: 2.34–3.00 Mostly Employed; 1.67 – 2.33 Employed; 1.00 – 1.66 Least Employed

School Size. When classified according to school size, the mostly employed strategies in teaching mathematics of teachers who came from small schools are the following: Building on learners' prior knowledge when introducing new mathematical concepts (M=2.94), Encouraging learners to engage in discussions that deepen their understanding of mathematics (M=2.92) and Facilitating tasks that encourage learners to explain their thinking and reasoning (M=2.91).

On the other hand, the mostly employed strategies in teaching mathematics of teachers who came from medium schools are the following: Building on learners' prior knowledge when introducing new mathematical concepts (M=2.87), Encouraging learners to engage in discussions that deepen their understanding of mathematics (M=2.85) and Facilitating tasks that encourage learners to explain their thinking and reasoning (M=2.82).

Finally, the mostly employed strategies in teaching mathematics of teachers who came from large schools are the following: Building on learners' prior knowledge when introducing new mathematical concepts (M=2.83), Encouraging learners to engage in discussions that deepen their understanding of mathematics (M=2.82) and Facilitating tasks that encourage learners to explain their thinking and reasoning (M=2.82).

The above findings indicate that regardless of school size, all teachers use the methods, techniques and procedures to help learners learn in Mathematics. Table 5 shows the data.

Table 5. Teachers' Strategies in Teaching Mathematics When Classified According to School Size

Innovative Strategies	SCHOOL SIZE					
	Small		Medium		Large	
	Mean	Description	Mean	Description	Mean	Description
Using learner-centered activities (e.g., group work, problem solving) in mathematics lessons.	2.81	Mostly Employed	2.47	Mostly Employed	2.80	Mostly Employed
Providing timely and constructive feedback to learners to help them improve their learning.	2.85	Mostly Employed	2.45	Mostly Employed	2.73	Mostly Employed
Building on learners' prior knowledge when introducing new mathematical concepts.	2.94	Mostly Employed	2.87	Mostly Employed	2.83	Mostly Employed
Encouraging learners to engage in discussions that deepen their understanding of mathematics.	2.92	Mostly Employed	2.85	Mostly Employed	2.82	Mostly Employed
Using collaborative learning strategies where learners work together to solve problems.	2.90	Mostly Employed	2.56	Mostly Employed	2.75	Mostly Employed
Modifying instructional strategies to meet the diverse needs of learners in mathematics.	2.90	Mostly Employed	2.49	Mostly Employed	2.69	Mostly Employed
Designing activities that actively involve learners in learning mathematical concepts.	2.70	Mostly Employed	2.55	Mostly Employed	2.68	Mostly Employed
Using questioning techniques that promote higher-order thinking.	2.79	Mostly Employed	2.47	Mostly Employed	2.68	Mostly Employed
Integrating real-world examples to make lessons more relevant and meaningful.	2.82	Mostly Employed	2.40	Mostly Employed	2.71	Mostly Employed
Monitoring learner progress during lessons and adjust teaching strategies accordingly.	2.85	Mostly Employed	2.51	Mostly Employed	2.72	Mostly Employed
Facilitating tasks that encourage learners to explain their thinking and reasoning.	2.91	Mostly Employed	2.82	Mostly Employed	2.82	Mostly Employed
Helping learners set clear learning goals in mathematics at the beginning of lessons.	2.88	Mostly Employed	2.56	Mostly Employed	2.75	Mostly Employed
Incorporating technology to support interactive learning in mathematics.	2.70	Mostly Employed	2.38	Mostly Employed	2.69	Mostly Employed
Using scaffolded tasks that gradually increase in complexity to support learner learning.	2.82	Mostly Employed	2.11	Employed	2.68	Mostly Employed

Reflecting on teaching strategies after lessons to improve future instruction.	2.82	Mostly Employed	2.53	Mostly Employed	2.78	Mostly Employed
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Scale of Means: 2.34–3.00 Mostly Employed; 1.67 – 2.33 Employed; 1.00 – 1.66 Least Employed

Internet Connectivity. When classified according to internet connectivity, the mostly employed strategies in teaching mathematics of teachers with internet connectivity are the following: Building on learners' prior knowledge when introducing new mathematical concepts (M=2.83), Encouraging learners to engage in discussions that deepen their understanding of mathematics (M=2.80) and Facilitating tasks that encourage learners to explain their thinking and reasoning (M=2.80).

On the other hand, the mostly employed strategies in teaching mathematics of teachers without internet connectivity are the following: Building on learners' prior knowledge when introducing new mathematical concepts (M=2.83), Encouraging learners to engage in discussions that deepen their understanding of mathematics (M=2.74) and Facilitating tasks that encourage learners to explain their thinking and reasoning (M=2.73).

The above findings indicate that both teachers with or without internet connectivity use the methods, techniques and procedures to help learners learn in Mathematics.

Table 6 shows the data.

Table 6. Teachers' Strategies in Teaching Mathematics When Classified According to Internet Connectivity

Teachers' Strategies	INTERNET CONNECTIVITY			
	With Internet		Without Internet	
	Mean	Description	Mean	Description
Using learner-centered activities (e.g., group work, problem solving) in mathematics lessons.	2.78	Mostly Employed	2.37	Mostly Employed
Providing timely and constructive feedback to learners to help them improve their learning.	2.69	Mostly Employed	2.56	Mostly Employed
Building on learners' prior knowledge when introducing new mathematical concepts.	2.83	Mostly Employed	2.83	Mostly Employed
Encouraging learners to engage in discussions that deepen their understanding of mathematics.	2.80	Mostly Employed	2.74	Mostly Employed
Using collaborative learning strategies where learners work together to solve problems.	2.74	Mostly Employed	2.59	Mostly Employed
Modifying instructional strategies to meet the diverse needs of learners in mathematics.	2.70	Mostly Employed	2.52	Mostly Employed
Designing activities that actively involve learners in learning mathematical concepts.	2.65	Mostly Employed	2.63	Mostly Employed
Using questioning techniques that promote higher-order thinking.	2.68	Mostly Employed	2.41	Mostly Employed
Integrating real-world examples to make lessons more relevant and meaningful.	2.69	Mostly Employed	2.37	Mostly Employed
Monitoring learner progress during lessons and adjust teaching strategies accordingly.	2.70	Mostly Employed	2.59	Mostly Employed
Facilitating tasks that encourage learners to explain their thinking and reasoning.	2.80	Mostly Employed	2.73	Mostly Employed
Helping learners set clear learning goals in mathematics at the beginning of lessons.	2.75	Mostly Employed	2.52	Mostly Employed
Incorporating technology to support interactive learning in mathematics.	2.64	Mostly Employed	2.41	Mostly Employed
Using scaffolded tasks that gradually increase in complexity to support learner learning.	2.63	Mostly Employed	1.96	Employed
Reflecting on teaching strategies after lessons to improve future instruction.	2.77	Mostly Employed	2.37	Mostly Employed

Scale of Means: 2.34–3.00 Mostly Employed; 1.67 – 2.33 Employed; 1.00 – 1.66 Least Employed

Level of Effectiveness of Digital Tools in Teaching Mathematics as Assessed by the Respondents When Taken as a Whole

The level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when taken as a whole was determined by computing the mean scores.

When taken as a whole, the level of effectiveness of digital tools in teaching mathematics as assessed by the respondents is "Very High" with an obtained overall mean score of 4.49. A scrutiny of the means in the same table reveals that teachers obtained a highest mean score in the indicators "Help learners visualize and explore complex mathematical ideas more effectively" (M=4.58), "Improve learners' problem-solving skills" (M=4.57), and "Enhance teachers' capability in the preparation of learning materials" (M=4.53) described as "Very High" while they obtained the lowest mean score in the indicators "Increase learner engagement during mathematics lessons" (M=4.37), "Help reduce mathematics anxiety among learners" (M=4.41) and "Learners make more motivated to learn" (M=4.45) described also as "Very High."

This result means that digital tools enhance the teaching and learning of mathematics all the time. This is indicated helping learners visualize and explore complex mathematical ideas more effectively, improving learners' problem-solving skills and enhancing teachers' capability in the preparation of learning material.

This finding support the study of *Filiz (2025)* that digital tools contribute to concretizing abstract mathematics concepts, improving student outcomes and fostering more interactive learning environments, especially when teachers integrate them effectively into pedagogy.

This also affirms the findings of *Arhimah, Cudjoe-Mensah and Thompson (2025)* that tailored digital tools can support individualized learning pathways, leading to enhanced engagement and improved problem-solving performance for diverse learners.

Table 7 presents the data.

Table 7. Level of Effectiveness of Digital Tools in Teaching Mathematics as Assessed by the Respondents When Taken as a Whole

Category	Mean	Description
Digital tools (e.g., kahoot, quizizz, geogebra) make mathematics lessons more engaging for learners.	4.50	Very High
Improve understanding of mathematics concepts when digital tools are incorporated into lessons.	4.49	Very High
Used in mathematics instruction leads to better overall learners' academic performance.	4.50	Very High
Help learners visualize and explore complex mathematical ideas more effectively.	4.58	Very High
Increase learner engagement during mathematics lessons.	4.37	Very High
Facilitate immediate and meaningful feedback for learners during mathematics activities.	4.48	Very High
Help reduce mathematics anxiety among learners.	4.41	Very High
Support differentiated learning for learners with diverse needs in mathematics.	4.49	Very High
Increase learner participation and collaboration in mathematics lessons.	4.47	Very High
Enhance the quality of classroom assessment in mathematics.	4.49	Very High
Learners make more motivated to learn.	4.45	Very High
Improve instructional strategies for teaching mathematics.	4.50	Very High
Make learning more enjoyable for learners.	4.51	Very High
Improve learners' problem-solving skills.	4.57	Very High
Enhance teachers' capability in the preparation of learning materials.	4.53	Very High
Overall Mean	4.49	Very High

Scale of Means: 4.21–5.00 Very High; 3.41 – 4.20 High; 2.61 – 3.40 Moderate; 1.81-2.60 Low t; 1.00 – 1.80 Very Low

Level of Effectiveness of Digital Tools in Teaching Mathematics as Assessed by the Respondents When Classified According to Educational Attainment, Position, Length of Teaching Experience, School Size and Internet Connectivity

The level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when classified according to educational attainment, position, length of teaching experience, school size and internet connectivity was determined by computing the mean scores.

When classified according to educational attainment, teachers who are holder of bachelor's degree (M=4.36) and master's degree (M=4.67) assessed the level of effectiveness of digital tools in teaching Mathematics as "Very High."

When classified according to position, both teachers occupying the position of Teacher I-III (M=4.48) and Master Teacher I-II (M=4.61) assessed the level of effectiveness of digital tools in teaching Mathematics as "Very High."

When classified according to length of teaching experience, both teachers with short (M=4.59) and long (M=4.40) teaching experience assessed the level of effectiveness of digital tools in teaching Mathematics as "Very High."

When classified according to school size, teachers who came from small (M=4.77), medium (M=4.26) and large (M=4.57) assessed the level of effectiveness of digital tools in teaching Mathematics as "Very High."

When classified according to internet connectivity, teachers with internet connectivity (M=4.56) assessed the level of effectiveness of digital tools in teaching Mathematics as "Very High while teachers without (M=4.06) internet connectivity assessed the level of effectiveness of digital tools in teaching Mathematics as "High."

This result means that regardless of educational attainment, position, length of teaching experience, school size and internet connectivity, teachers in this study believe that digital tools enhance the teaching and learning of mathematics all the time.

This is consistent with the findings of *Infante, Abobo, and Crisolago (2025)* who found that digital tools supported lesson structure, interactive learning,

and problem-solving skills, contributing to enhanced student engagement and comprehension.

Likewise, it affirms the finding of *Kandukoori, Kandukoori and Wajid (2024)* that digital tools can enhance mathematics achievement more effectively than traditional practices.

Table 8 presents the data.

Table 8. Level of Effectiveness of Digital Tools in Teaching Mathematics as Assessed by the Respondents When Classified According to Educational Attainment, Position, Length of Teaching Experience, School Size and Internet Connectivity

Variables	Mean	Description
Educational Attainment		
Bachelor's Degree	4.36	Very High
Master's Degree	4.67	Very High
Position		
Teacher I-III	4.48	Very High
Master Teacher I-II	4.61	Very High
Length of Teaching Experience		
Short	4.59	Very High
Long	4.40	Very High
School Size		
Small	4.77	Very High
Medium	4.26	Very High
Large	4.57	Very High
Internet Connectivity		
With Internet	4.56	Very High
Without Internet	4.06	High

Scale of Means: 4.21–5.00 Very High; 3.41 – 4.20 High; 2.61 – 3.40 Moderate; 1.81-2.60 Low t; 1.00 – 1.80 Very Low

Differences in the Teachers' Strategies in Teaching Mathematics When Classified According to Educational Attainment, Position, Length of Teaching Experience and Internet Connectivity

As reflected in Table 10, significant differences existed in the teachers' strategies in teaching mathematics when classified according to educational attainment, $U=3046.500$, $p < .05$; position, $U=1673.000$, $p < .05$; length of teaching experience, $U=3999.500$, $p < .05$; and internet connectivity, $U=1146.500$, $p < .05$. Thus, the null hypothesis which states that there are no significant differences in the teachers' strategies in teaching mathematics when classified according to educational attainment, position, length of teaching experience and internet connectivity was rejected.

The above findings indicate that teachers differ in their strategies in teaching mathematics when their educational attainment, position, length of teaching experience and internet connectivity are considered.

This means that these profile variables significantly differ how teachers plan, deliver, and manage mathematics instruction. Teachers with higher educational attainment may possess more advanced pedagogical knowledge and content expertise, enabling them to utilize a wider range of instructional approaches. Likewise, teachers occupying higher positions may have greater exposure to professional development opportunities, leadership experiences, and innovative teaching practices that shape their instructional strategies. Differences in teaching experience can also affect strategy selection, as more experienced teachers often develop a broader repertoire of techniques through years of classroom practice, while less experienced teachers may rely on recently learned methodologies. Furthermore, internet connectivity influences teachers' access to digital resources, online learning platforms, and technology-enhanced instructional tools, which can significantly affect the methods they employ in mathematics teaching. Therefore, the significant differences observed means that teachers' professional qualifications, career progression, teaching experience, and technological access collectively contribute to variations in the strategies they use to facilitate mathematics learning among learners.

This corroborates the findings of *Cabrera (2024)* who found that teachers' profile characteristics, particularly educational attainment and years of teaching Mathematics, were significantly associated with the utilization of innovative teaching strategies such as problem-solving, cooperative learning, and the use of manipulatives.

Table 9. Significant Differences in the Teachers' Strategies in Teaching Mathematics When Classified According to Educational Attainment, Position, Length of Teaching Experience and Internet Connectivity

Variables	Mean Rank	U-test value	p-value	Remarks
Educational Attainment				
Bachelor's Degree	85.60	3046.500	.000	Significant
Master's Degree	124.30			
Position				
Teacher I-III	99.79	1673.000	.000	Significant
Master Teacher I-II	115.45			
Length of Teaching Experience				
Short	112.90	3999.500	.008	Significant
Long	91.38			
Internet Connectivity				
With Internet	108.45	1146.500	.000	Significant
Without Internet	56.46			
p<.05, Significant				

Differences in the Teachers' Strategies in Teaching Mathematics When Classified According to School Size

As reflected in Table 11, significant differences existed in the teachers' strategies in teaching mathematics when classified according to school size, $H = 37.265$, $p < .05$. Thus, the null hypothesis which states that there are no significant differences in the teachers' strategies in teaching mathematics when classified according to school size was rejected.

The above findings indicate that teachers differ in their strategies in teaching mathematics when school size is considered.

This result means that school size has bearing on the instructional approaches and methods employed by teachers. Teachers in larger schools may have access to more educational resources, specialized facilities, professional learning communities, and collaborative opportunities that enable them to implement diverse and innovative teaching strategies. In contrast, teachers in smaller schools may adopt more individualized and flexible approaches due to smaller class sizes and closer teacher-student interactions. School size may also affect classroom management practices, availability of instructional materials, and opportunities for differentiated instruction, all of which contribute to variations in teaching strategies. Therefore, the significant difference means that school size plays an important role in shaping how teachers deliver mathematics instruction and address the learning needs of their learners.

This is consistent with the findings of *Osborne (2021)* who found that instructional strategies in Mathematics varied significantly across schools, suggesting that school-level characteristics, including organizational context and school size, contribute to differences in how teachers implement teaching strategies.

Table 10. Significant Differences in the Teachers' Strategies in Teaching Mathematics When Classified According to School Size

Variables	Mean Rank	H-test value	p-value	Remarks
School Size				
Small	131.89	37.265	.000	Significant
Medium	62.86			
Large	111.34			
p<.05, Significant				

Differences in the Level of Effectiveness of Digital Tools in Teaching Mathematics as Assessed by the Respondents When Classified According to Educational Attainment, Position, Length of Teaching Experience and Internet Connectivity

As reflected in Table 12, significant differences existed in the level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when classified according to educational attainment, $U = 3370.000$, $p < .05$; position, $U = 1678.500$, $p < .05$; length of teaching experience, $U = 4031.000$, $p < .05$ and internet connectivity, $U = 1116.000$, $p < .05$. Thus, the null hypothesis which states that there are no significant differences in the level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when classified according to educational attainment, position, length of teaching experience and internet connectivity was rejected.

The above findings indicate that respondents differ in their assessment of the level of effectiveness of digital tools in teaching mathematics when classified according to educational attainment, position, length of teaching experience and internet connectivity.

This finding indicates that teachers' perceptions regarding the effectiveness of digital tools are shaped by their educational attainment, position, teaching experience, and access to Internet. Teachers with higher educational attainment may have greater exposure to technology integration and contemporary instructional practices, leading to different evaluations of the effectiveness of digital tools compared to those with lower educational attainment. Similarly, teachers holding different positions may vary in their experiences, responsibilities, and opportunities for professional development, which can shape their perceptions of effectiveness of digital tools. Length of teaching experience may also shape assessments, as experienced teachers and novice teachers may differ in their familiarity, confidence, and adaptability in using digital tools. Furthermore, internet connectivity plays a crucial role in determining the accessibility and functionality of digital tools; teachers with reliable internet access are more likely to experience the full benefits of these technologies, resulting in more favorable assessments. Therefore, the significant differences observed means that both professional and technological factors contribute to varying perceptions of the effectiveness of digital tools in enhancing mathematics instruction.

This corroborates the findings of *Engelbrecht and Borba (2024)* that educators' backgrounds, experiences, and professional expertise affect the ways in which digital tools are employed and the extent to which such technologies enhance mathematics learning. Teachers with stronger pedagogical and technological knowledge were found to implement digital tools more effectively than those with limited preparation.

Table 11. Significant Differences in the Level of Effectiveness of Digital Tools in Teaching Mathematics as Assessed by the Respondents When Classified According to Educational Attainment, Position, Length of Teaching Experience and Internet Connectivity

Variables	Mean Rank	U-test value	p-value	Remarks
Educational Attainment				
Bachelor's Degree	88.32	3370.000	.000	Significant
Master's Degree	120.40			
Position				
Teacher I-III	99.83	1678.500	.000	Significant
Master Teacher I-II	115.20			
Length of Teaching Experience				
Short	112.57	4031.000	.011	Significant
Long	91.67			
Internet Connectivity				
With Internet	108.62	1116.000	.000	Significant
Without Internet	55.33			

$p < .05$, Significant

Differences in the Level of Effectiveness of Digital Tools in Teaching Mathematics as Assessed by the Respondents When Classified According to School Size

As reflected in Table 13, significant differences existed in the level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when classified according to school size, $H = 35.224$, $p < .05$. Thus, the null hypothesis which states that there are no significant differences in the level of effectiveness of digital tools in teaching mathematics as assessed by the respondents when classified according to school size was rejected.

The above findings indicate that respondents differ in their assessment of the level of effectiveness of digital tools in teaching mathematics when school size is considered.

This finding indicates that the size of the school significantly differ how teachers perceive the effectiveness of digital tools in teaching mathematics. Larger schools may have greater access to technological infrastructure, digital devices, technical support, and professional development opportunities, enabling teachers to maximize the benefits of digital tools and view them more positively. In contrast, teachers in smaller and medium schools may encounter limitations in resources, technology access, or support systems, which can affect their experiences and perceptions of these tools. Therefore, the significant difference in assessments indicates that school size plays an important role in shaping teachers' perceptions of how effectively digital tools enhance mathematics teaching and learning.

This is supported by the study of *Engelbrecht and Borba (2024)* that schools with stronger technological ecosystems and professional support are better positioned to realize the instructional benefits of digital mathematics tools, a pattern consistent with observed differences across school-size categories.

Table 12. Significant Differences in the Level of Effectiveness of Digital Tools in Teaching Mathematics as Assessed by the Respondents When Classified According to School Size

Variables	Mean Rank	H-test value	p-value	Remarks
School Size				
Small	137.09	35.224	.000	Significant
Medium	65.45			
Large	108.59			
p<.05, Significant				

Relationship Between Teachers' Strategies and Effectiveness of Digital Tools in Teaching Mathematics

This study finally aimed to find out the significant relationship between teachers' strategies and effectiveness of digital tools in teaching mathematics using Spearman's ρ correlation.

Result of Spearman's ρ correlation show that positive and significant relationship existed between teachers' strategies and effectiveness of digital tools in teaching mathematics, $\rho = .785$, $p < .05$. Thus, the null hypothesis which states that there is no significant relationship between teachers' strategies and effectiveness of digital tools in teaching mathematics was rejected.

This finding indicates that teachers' strategies are significantly related to effectiveness of digital tools in teaching mathematics.

This means that the strategies employed by teachers have a meaningful impact on how effectively digital tools are utilized to facilitate mathematics learning. Teachers who implement appropriate, innovative, and learner-centered strategies are more likely to maximize the potential of digital tools by integrating them purposefully into instruction, thereby enhancing learner engagement, understanding, and achievement. Conversely, the effectiveness of digital tools may be limited when instructional strategies do not align with the capabilities of the technology or the learning needs of learners. The significant relationship indicates that digital tools alone do not guarantee effective teaching and learning; rather, their success depends largely on how teachers incorporate them into their pedagogical practices. Therefore, the finding underscores the importance of equipping teachers with both technological competence and effective instructional strategies to ensure that digital tools contribute meaningfully to the teaching and learning of mathematics.

This is supported by the study of Weigand, Trgalova, and Tabach (2024) that the effectiveness of digital tools is closely associated with teachers' instructional strategies and pedagogical decisions.

Likewise, it aligns to the findings of Kohnke, Moorhouse, and Zou (2024) who found that mathematics teachers' perceptions of the pedagogical impact of digital technologies were significantly influenced by how well these technologies aligned with their instructional strategies. Teachers who demonstrated greater initiative in integrating technology and who perceived digital tools as compatible with their teaching strategies reported higher levels of instructional effectiveness.

Table 13 presents the data.

Table 13. Significant Relationship Between Teachers' Strategies and Effectiveness of Digital Tools in Teaching Mathematics

		Teachers' Strategies	Effectiveness of Digital Tools	Remarks
Teachers' Strategies	Spearman's rho	1.000	.785	Significant
	p-value		.000	
	N	202	202	
Effectiveness of Digital Tools	Spearman's rho	.785	1.000	Significant
	p-value	.000		
	N	202	202	

p<.05, Significant

CONCLUSIONS

Based on the above-mentioned findings, these conclusions were drawn by the researcher:

1. All teachers in the District of Caluya, Schools Division of Antique use the methods, techniques and procedures to help learners learn in Mathematics.
2. The teachers in the District of Caluya, Schools Division of Antique believe that digital tools effectively enhance the teaching and learning of mathematics.
3. Teachers in this study differ in their strategies in teaching mathematics when their educational attainment, position, length of teaching experience, school size, and internet connectivity are considered.

4. Teachers in this study differ in their assessment of the effectiveness of digital tools in teaching mathematics when their educational attainment, position, length of teaching experience, school size, and internet connectivity are considered.
5. Teachers' strategies are significantly related to the effectiveness of digital tools in teaching mathematics.

RECOMMENDATIONS

Based on the findings and conclusions, the researcher recommends the following:

1. Higher officials at the Department of Education (DepEd) may strengthen the implementation of continuous and needs-based professional development programs focused on innovative, learner-centered, and technology-integrated instructional strategies. These programs may provide teachers with opportunities to develop their pedagogical content knowledge, master effective mathematics teaching strategies, and utilize data-driven strategies to address diverse learner needs. Additionally, education officials may establish mentoring and coaching systems wherein master teachers and mathematics specialists provide guidance and support to classroom teachers in improving instructional delivery.
2. School heads may take a proactive role in creating a supportive and technology-rich learning environment. They may organize regular training workshops, seminars, and coaching sessions that equip teachers with the knowledge and skills necessary to effectively integrate digital tools into mathematics instruction. School heads may also ensure the availability and proper maintenance of technological resources, such as computers, tablets, projectors, and stable internet connectivity, to facilitate seamless implementation of technology-based learning activities.
3. School heads may provide sustained instructional leadership by promoting continuous professional development and fostering a culture of collaborative learning within the school. They may organize training programs, workshops, lesson demonstrations, and mentoring activities that focus on effective mathematics pedagogy, differentiated instruction, problem-solving approaches, and learner-centered teaching strategies.
4. Teachers may strategically integrate digital tools into lesson planning and instructional delivery by selecting technologies that align with specific learning objectives and learners' needs. They may also utilize interactive applications, educational software, virtual manipulatives, and online assessment platforms to promote active engagement, collaboration, and deeper conceptual understanding among learners.
5. Teachers may engage in continuous professional growth by participating in seminars, workshops, training programs, and learning communities that focus on innovative pedagogical approaches and technology integration. They may adopt learner-centered and inquiry-based instructional strategies that encourage critical thinking, problem-solving, collaboration, and active learner participation. They may also carefully select and utilize digital tools that are aligned with lesson objectives and learners' needs, ensuring that technology serves as a meaningful support to instruction rather than merely a supplementary resource.
6. Future researchers may conduct further investigations that explore the underlying factors influencing teachers' strategies and the effectiveness of digital tools in teaching mathematics. Replicating the study in different contexts, such as other regions or educational levels, may also help validate and generalize the present findings.

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