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# TECHNOLOGY-AIDED TEACHING APPROACHES IN MATHEMATICS AMONG ELEMENTARY TEACHERS AND LEARNERS' LEARNING MOTIVATION: BASIS FOR AN EDUCATION 5.0-INSPIRED INSTRUCTIONAL PROGRAM

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## ABSTRACT
Technology-aided teaching approaches significantly enhance learners' motivation in mathematics by fostering engagement, addressing diverse learning needs, and simplifying complex concepts. These strategies are vital in modern education as they promote interactive and meaningful learning experiences essential for developing mathematical skills. This study aimed to assess the use of technology-aided teaching approaches in mathematics among elementary teachers and their correlation with learners' learning motivation in the San Felipe District, Schools Division of Zambales, during the School Year 2024-2025. Using a descriptive-correlational research design, data were collected from 89 elementary teacher respondents selected through simple random sampling. A validated researcher-designed questionnaire demonstrated excellent reliability (Cronbach's Alpha = .982 for teaching approaches and .974 for learning motivation). The majority of teachers were aged 30-39 years, predominantly female, assigned to intermediate grades, and held Teacher III positions with 10-19 years of service. They had attained master's units and attended 1-2 training sessions in technology-aided teaching. Approaches such as play-based learning, math stations and centers, visual aids, manipulatives, and songs and rhymes were moderately consistent and evident. Learners' motivation strategies, including providing choices, using real-life contexts, and celebrating successes, were positively consistent and frequently observed. No significant differences were noted between teaching approaches and teachers' demographic profiles. However, a very high positive significant correlation was found between technology-aided teaching approaches and learners' motivation, underscoring their impact on active learning. The findings highlight the need for more training and targeted interventions to enhance the use of these approaches. An Education 5.0-inspired instructional program was developed to refine teaching practices and further improve learners' motivation, contributing actionable insights for optimizing mathematics instruction in elementary education.

**Keywords:** Technology-aided Teaching, Mathematics Instruction, Learners' Motivation, Elementary Education, Education 5.0.

## 1. INTRODUCTION
In today's rapidly evolving educational landscape, the integration of technology into teaching methodologies is not merely an option but a necessity. Technology-aided teaching approaches have been gaining momentum globally as schools increasingly rely on digital tools to enhance learning outcomes and learner motivation. However, the effective implementation of these tools presents challenges, particularly in subjects like mathematics, where students often struggle with conceptual understanding. This issue is especially significant in regions with limited resources or inconsistent access to modern technological infrastructure.

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Globally and nationally, the push for Education 5.0, which emphasized personalized, technology-driven learning, gained traction. In rural areas like the San Felipe District of Zambales, gaps in access to technology and its integration into classrooms affected both teaching effectiveness and learner motivation. According to Cabling (2024), technology-aided instruction fostered positive academic outcomes, particularly when learners were provided with individualized pacing and real-world skill development. However, despite the documented benefits of technology-aided instruction in various settings, the challenge of implementing technology in a way that effectively engaged students in subjects like mathematics remained unresolved. Glumbic, Dordevic, and Brojcin (2022) argued that while technology enhanced skills such as problem-solving and social engagement, its application needed to be carefully tailored to different age groups and educational settings.

The need for tailored technological solutions was especially urgent in the Philippines, where educational gaps persisted due to unequal access to resources. Studies, such as that by Jiang, Liang, and Wu (2024), highlighted the potential of technology-aided teaching to promote critical thinking skills and enhance learning outcomes. These findings aligned with the results of Abbey, Ma, Akhtar, Emmers, Fairlie, Fu, Johnstone, Layalka, Rozelle, Xue, and Zhang (2024), who noted small yet positive effects of Education technology on student learning in China, particularly through computer-assisted learning. However, more evidence was required to determine the full impact of technology-aided instruction, particularly in elementary education. In addition, Arriesgado, Arriesgado, Gallego, and Solon (2024) pointed out that while students often preferred technology-aided lessons, the results varied depending on how these tools were utilized in comparison to traditional methods like demonstration-based instruction.

The primary purpose of this study was to investigate how technology-aided teaching approaches in mathematics influenced learner motivation among elementary students in the San Felipe District, Schools Division of Zambales. By focusing on local context and teacher and learner experiences, the research aimed to fill gaps in existing literature regarding the effectiveness of technology-aided instruction in rural settings. As demonstrated by Esfandiari and Arefian (2024), technology-aided approaches fostered cognitive and motivational benefits among learners, particularly when coupled with collaborative and reflective practices. Drawing on such evidence, this study explored how technology could be harnessed to create an Education 5.0-inspired instructional program that met the needs of elementary students in mathematics.

The significance of this study lay in its potential to offer a blueprint for integrating technology into elementary mathematics instruction in a way that enhanced learner motivation and engagement. By examining local experiences, the study contributed to ongoing discussions about how best to apply educational technology in classrooms, particularly in resource-constrained environments like San Felipe District. Furthermore, it provided valuable insights into the development of 21st-century skills, such as critical thinking and problem-solving, which were essential for students' success in a technology-driven world.

## 2. STATEMENT OF THE PROBLEM

This study aimed to assess the technology-aided teaching approaches in mathematics among elementary teachers and learners’ learning motivation in San Felipe District, Schools Division of Zambales during the School Year 2024-2025.

Specifically, it sought to answer the following questions:

1. How may the profile of the respondents be described in terms of:

1.1. age;
1.2. gender;
1.3. grade assignment;
1.4. teaching position;
1.5. length of service;
1.6. highest educational attainment; and
1.7. number of training sessions attended in technology-aided teaching?

2. How may the technology-aided teaching approaches in mathematics of the respondents be described in terms of:
   2.1. play-based learning;
   2.2. math stations and centers;
   2.3. visual aids and manipulatives; and
   2.4. songs and rhymes?
3. How may the learners' learning motivation in mathematics as perceived by the respondents be described in terms of:
   3.1. providing choice;
   3.2. involving stories and characters;
   3.3. using real-life contexts; and
   3.4. celebrating successes?
4. Is there a significant difference between the technology-aided teaching approaches in mathematics of the respondents and their profile when grouped accordingly?
5. Is there a significant correlation between the technology-aided teaching approaches in mathematics of the respondents and their perceived learners' learning motivation?
6. What instructional program can be proposed to enhance the technology-aided teaching approaches in mathematics of the elementary teachers and their learners' learning motivation?

## 3. METHODS AND MATERIALS

This study aimed to assess the technology-aided teaching approaches in mathematics among elementary teachers and learners' learning motivation in San Felipe District, Schools Division of Zambales during the School Year 2024-2025. A descriptive-correlational research design was employed, with data collected, classified, summarized, and analyzed using percentages and means. The study involved 89 elementary teachers, selected through simple random sampling to ensure equal representation of the population. A researcher-designed questionnaire served as the primary data collection tool, targeting dimensions of technology-aided teaching approaches in mathematics and learners' learning motivation. The instrument demonstrated excellent reliability, as confirmed by Cronbach's Alpha values for technology-aided teaching approaches in mathematics ($\alpha = 0.982$) and learners' learning motivation ($\alpha = 0.974$). Statistical analyses, including the Spearman Rho Correlation Coefficient were used to test the study's hypotheses.

## 4. RESULTS AND DISCUSSIONS

### 4.1. Profile of the Respondents

#### 4.1.1. Age

Table 1 presented the profile of the respondents in terms of their age. The data revealed that the majority of the respondents (40 or 44.94%) were aged 30–39 years old, followed by those aged 40–49 years old (26 or 29.21%), while 19 respondents (21.35%) were aged 20–29 years old.

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Only a small percentage (4 or 4.49%) of the respondents were aged 50–59 years old, which indicated that most respondents were within the middle adulthood stage.

**Table 1. Profile of the Respondents in terms of Age**

| Age | f | % |
|---|---|---|
| 20-29 years old | 19 | 21.35 |
| 30-39 years old | 40 | 44.94 |
| 40-49 years old | 26 | 29.21 |
| 50-59 years old | 4 | 4.49 |
| **Total** | **89** | **100.00** |

This finding implied that the respondents were primarily in their productive years, which could have influenced their teaching practices and adaptability to changes in instructional methodologies. The smaller percentage of respondents in the 50–59 age group suggested potential generational differences in pedagogical preferences and approaches. The findings of Tapalova, Zhiyenbayeva, and Abdigapbarova (2024) regarding the dominance of middle-aged teachers in teaching aligned with the present study, emphasizing the significance of this age group in shaping educational outcomes.

**4.1.2. Gender**

Table 2 displays the profile of the respondents in terms of their gender. The data showed that the majority of the respondents (73 or 82.02%) were female, while 11 respondents (12.36%) were male. A small percentage (3 or 3.37%) identified as LGBTQIA+, which indicated a predominantly female population among the respondents.

**Table 2. Profile of the Respondents in terms of Gender**

| Gender | f | % |
|---|---|---|
| Male | 11 | 12.36 |
| Female | 73 | 82.02 |
| LGBTQIA+ | 3 | 3.37 |
| **Total** | **89** | **100.00** |

This finding implied that female teachers dominated the sample, which could have influenced the teaching environment and perspectives in the study. The inclusion of LGBTQIA+ respondents highlighted the diversity in gender representation, albeit minimal. The findings of Kundu (2022) regarding the predominance of female teachers in teaching closely aligned with the present study, reaffirming the significant role of women in the education sector.

**4.1.3. Grade Assignment**

Table 3 illustrates the profile of the respondents in terms of their grade assignments. The data showed that the majority of the respondents (43 or 48.31%) were assigned to intermediate grades, followed by 38 respondents (42.70%) in primary grades. A smaller portion (8 or 8.99%) were assigned to kindergarten, which indicated that most respondents taught higher grade levels.

**Table 3. Profile of the Respondents in terms of Grade Assignment**

| Grade Assignment | f | % |
|---|---|---|
| Kindergarten | 8 | 8.99 |
| Primary Grade | 38 | 42.70 |
| Intermediate Grade | 43 | 48.31 |
| **Total** | **89** | **100.00** |

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This finding implied that intermediate and primary grade teachers formed the bulk of the sample, reflecting their critical role in shaping foundational and advanced learning competencies. The smaller representation of kindergarten teachers suggested a focus on early childhood education that may require further exploration. The findings of Geletu and Mihiretie (2022) regarding the predominance of teachers assigned to intermediate and primary grades aligned with the present study, underscoring their significant contributions to learner development.

**4.1.4. Teaching Position**

Table 4 exhibits the profile of the respondents in terms of their teaching positions. The data showed that the majority of the respondents (32 or 35.96%) held the position of Teacher III, followed by 27 respondents (30.34%) as Teacher I, and 19 respondents (21.35%) as Teacher II. A smaller percentage of respondents were Contractual Teachers (5 or 5.62%), Master Teacher II (4 or 4.49%), and Master Teacher I (2 or 2.25%), which indicated a diverse distribution of teaching positions.

**Table 4. Profile of the Respondents in terms of Teaching Position**

| Teaching Position | f | % |
|---|---|---|
| Contractual Teacher | 5 | 5.62 |
| Teacher I | 27 | 30.34 |
| Teacher II | 19 | 21.35 |
| Teacher III | 32 | 35.96 |
| Master Teacher I | 2 | 2.25 |
| Master Teacher II | 4 | 4.49 |
| **Total** | **89** | **100.00** |

This finding implied that most respondents were in permanent teaching positions, reflecting stability and experience in their roles. The lower representation of contractual and master teachers suggested variations in career progression and access to higher professional ranks. The findings of Pugach (2023) regarding the distribution of teaching positions, with a majority in the Teacher III rank, aligned with the present study, highlighting the concentration of experienced teachers in the teaching workforce.

**4.1.5. Length of Service**

Table 5 summarizes the profile of the respondents in terms of their length of service. The data showed that the majority of the respondents (47 or 52.81%) had 10–19 years of service, followed by 37 respondents (41.57%) with 0–9 years of service. A much smaller percentage had 20–29 years of service (4 or 4.49%) or 30 years and above (1 or 1.12%), which indicated that most respondents were mid-career teachers.

**Table 5. Profile of the Respondents in terms of Length of Service**

| Length of Service | f | % |
|---|---|---|
| 0-9 years | 37 | 41.57 |
| 10-19 years | 47 | 52.81 |
| 20-29 years | 4 | 4.49 |
| 30 years and above | 1 | 1.12 |
| **Total** | **89** | **100.00** |

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This finding implied that the respondents had substantial teaching experience, which could have influenced their effectiveness and perspectives on educational practices. The minimal representation of long-serving teachers suggested potential gaps in teacher retention or fewer senior teachers participating in the study. The findings of Levrints and Greba (2022) regarding the prevalence of teachers with mid-level teaching experience aligned with the present study, reinforcing the importance of this group in driving educational outcomes.

**4.1.6. Highest Educational Attainment**

Table 6 tabulates the profile of the respondents in terms of their highest educational attainment. The data showed that the majority of the respondents (51 or 57.30%) had earned Master's units, followed by 23 respondents (25.84%) who were Master's graduates. Smaller percentages included those with Doctorate units (4 or 4.49%), Doctorate graduates (2 or 2.25%), Education graduates (8 or 8.99%), and one respondent (1.12%) with only education units, which indicated a highly educated group of respondents.

**Table 6. Profile of the Respondents in terms of Highest Educational Attainment**

| Highest Educational Attainment | f | % |
|---|---|---|
| with Education units | 1 | 1.12 |
| Education Graduate | 8 | 8.99 |
| With Master's units | 51 | 57.30 |
| Master's Graduate | 23 | 25.84 |
| with Doctorate units | 4 | 4.49 |
| Doctorate Graduate | 2 | 2.25 |
| **Total** | **89** | **100.00** |

This finding implied that most respondents had pursued advanced studies, reflecting their commitment to professional growth and continuous learning. The smaller percentage of Doctorate holders highlighted the potential for further academic advancement among teachers. The findings of Fuentes, Maestre, Rivas, Barreto, and Alarcon (2023 regarding the prevalence of teachers with postgraduate education aligned with the present study, emphasizing the significant role of advanced educational attainment in shaping teaching practices and learner outcomes.

**4.1.7. Number of Training Sessions Attended in Technology-Aided Teaching**

Table 7 depicts the profile of the respondents in terms of the number of training sessions they attended in technology-aided teaching. The data revealed that the majority of the respondents (37 or 41.57%) had attended 1–2 training sessions, while 29 respondents (32.58%) had not attended any. Smaller percentages included those who attended 3–4 sessions (11 or 12.36%), 5–6 sessions (4 or 4.49%), 9–10 sessions (4 or 4.49%), 7–8 sessions (2 or 2.25%), and 11 or more sessions (2 or 2.25%), which indicated varied exposure to technology-aided teaching training among the respondents.

**Table 7. Profile of the Respondents in terms of Number of Training Sessions Attended in Technology-Aided Teaching**

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| Number of Training Sessions Attended in Technology-Aided Teaching | f | % |
|---|---|---|
| None | 29 | 32.58 |
| 1-2 | 37 | 41.57 |
| 3-4 | 11 | 12.36 |
| 5-6 | 4 | 4.49 |
| 7-8 | 2 | 2.25 |
| 9-10 | 4 | 4.49 |
| 11 and above | 2 | 2.25 |
| **Total** | **89** | **100.00** |

This finding implied that while some respondents had gained basic exposure to technology-aided teaching through training sessions, a significant portion lacked such opportunities, suggesting a potential gap in professional development. The minimal representation of those with extensive training highlighted the need to enhance access to technology-focused capacity-building programs. The findings of Futterer, Scherer, Scheiter, Sturmer, and Lachner (2023) regarding the uneven participation of teachers in technology-related training aligned with the present study, underscoring the need to prioritize continuous professional development in this area to improve teaching efficacy.

### 4.2. Technology-Aided Teaching Approaches in Mathematics

#### 4.2.1. Play-Based Learning

Table 8 outlines the mean and standard deviations of technology-aided teaching approaches in mathematics of the respondents in terms of play-based learning. The range of means (M) for each indicator in Table 8 was between 2.65 and 2.83, indicating that the technology-aided teaching approaches of the respondents in play-based learning were moderately evident. The general mean rating for all indicators was 2.73, and the general standard deviation (SD) was 0.914, suggesting that the implementation of play-based learning through technology in mathematics was moderately consistent among elementary teachers. These findings implied a moderate level of engagement and integration of digital tools to enhance math instruction through play-based methods.

**Table 8. Mean and Interpretations of the Technology-Aided Teaching Approaches in Mathematics of the Respondents in terms of Play-Based Learning**

| Indicator | M | Interpretation | SD |
|---|---|---|---|
| 1. I use educational math games on tablets or computers to make learning fun and interactive for my learners. | 2.74 | Moderately Evident | 1.006 |
| 2. I set up math-related play centers with digital tools where learners can practice their skills through hands-on activities. | 2.73 | Moderately Evident | .963 |
| 3. I incorporate interactive math apps into lessons that allow learners to solve problems while playing games. | 2.74 | Moderately Evident | .983 |
| 4. I create math-themes scavenger hunts using technology, where learners | 2.70 | Moderately Evident | 1.005 |

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|---|---|---|---|
| find and solve math problems around the classroom. | | | |
| 5. I use virtual manipulatives and math simulations to let learners explore and experiment with math concepts through play. | 2.83 | Moderately Evident | .968 |
| 6. I integrate digital storybooks and math animations into lessons, making learning math more engaging through play-based stories. | 2.82 | Moderately Evident | .960 |
| 7. I encourage learners to create and share their own math games using digital tools, promoting creativity and understanding of math concepts. | 2.65 | Moderately Evident | 1.046 |
| 8. I organize math challenges and competitions with digital games, rewarding learners for their problem-solving skills and creativity. | 2.67 | Moderately Evident | .974 |
| 9. I incorporate playful math apps that adapt to learners' levels, offering them different challenges based on their progress and abilities. | 2.71 | Moderately Evident | .991 |
| 10. I use online math puzzles and interactive quizzes to help learners practice and reinforce their math skills in a playful way. | 2.72 | Moderately Evident | .988 |
| **General Mean Rating** | **2.73** | **Moderately Evident** | **.914** |

The implication of this study suggested that while technology-aided play-based learning approaches were moderately evident, there was room for improvement in the consistency and integration of these methods to further engage learners in mathematics. Enhancing the variety and quality of digital tools and interactive activities could potentially lead to higher engagement and better understanding of math concepts among learners. The findings of Eden, Chisom, and Adeniyi (2024) aligned with the present study in suggesting that integrating technology into teaching strategies could enhance learner engagement and understanding of content. However, both studies implied that while moderate success had been achieved, there remained room for refining and expanding the use of digital tools to maximize educational outcomes.

**4.2.2. Math Stations and Centers**

Table 9 highlights the mean and standard deviations of technology-aided teaching approaches in mathematics of the respondents in terms of math stations and centers. The range of means (M) for each indicator in Table 9 was between 2.54 and 2.70, indicating that the technology-aided teaching approaches in math stations and centers were moderately evident. The general mean rating for all indicators was 2.60, and the general standard deviation (SD) was 0.962, suggesting that the implementation of math stations and centers with digital tools and resources was

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moderately consistent among elementary teachers. These findings implied a moderate level of engagement in using technology to enhance math learning through varied station-based activities.

**Table 9. Mean and Interpretations of the Technology-Aided Teaching Approaches in Mathematics of the Respondents in terms of Math Stations and Centers**

| Indicator | M | Interpretation | SD |
|---|---|---|---|
| 1. I set up different math stations with tablets and interactive games where learners practice various math skills. | 2.58 | Moderately Evident | 1.042 |
| 2. I use technology to create digital math centers that include fun activities like virtual manipulatives and math puzzles. | 2.63 | Moderately Evident | .981 |
| 3. I rotate learners through math stations, each equipped with different technology tools and resources, to keep them engaged and practicing diverse skills. | 2.55 | Moderately Evident | .989 |
| 4. I provide learners with tablets at math stations to explore educational apps that reinforce their current math topics. | 2.54 | Moderately Evident | 1.045 |
| 5. I organize math center activities that use online math games to help learners practice addition, subtraction, multiplication, and division. | 2.66 | Moderately Evident | .976 |
| 6. I use digital whiteboards at math stations where learners can work on interactive math problems and receive immediate feedback. | 2.52 | Moderately Evident | 1.024 |
| 7. I integrate interactive math software into station activities, allowing learners to work on problems at their own pace and track their progress. | 2.60 | Moderately Evident | 1.030 |
| 8. I set up tech-enhanced math centers where learners can use virtual manipulatives to explore concepts like fractions and geometry. | 2.56 | Moderately Evident | 1.011 |
| 9. I assign group tasks at math stations that involve using digital tools to solve math challenges collaboratively. | 2.65 | Moderately Evident | 1.012 |
| 10. I incorporate video tutorials and interactive lessons at math centers to help earners understand new concepts | 2.70 | Moderately Evident | .993 |

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| and practice their skills in a technology-friendly environment. | | | |
| **General Mean Rating** | **2.60** | **Moderately Evident** | **.962** |

The implication of this study suggested that while technology-aided math stations and centers were moderately evident, there was room for improvement in diversifying the activities and enhancing the consistency of the implementation to further engage learners in math practice. Expanding the use of digital tools and integrating more interactive tasks could potentially lead to better learner engagement and deeper understanding of math concepts. The findings of Paudel (2023) aligned with the present study in suggesting that incorporating technology into teaching practices can enhance learner engagement in math through various station-based activities. Both studies imply that there is potential for improvement in the effective use of digital tools to support math instruction, with an emphasis on creating more interactive and varied learning experiences for learners.

### 4.2.3. Visual Aids and Manipulatives

Table 10 expounds the mean and standard deviations of technology-aided teaching approaches in mathematics of the respondents in terms of visual aids and manipulatives. The range of means (M) for each indicator in Table 10 was between 2.64 and 3.00, indicating that the technology-aided teaching approaches in visual aids and manipulatives were moderately evident. The general mean rating for all indicators was 2.77, and the general standard deviation (SD) was 0.933, suggesting that the integration of visual aids and manipulatives through digital tools was moderately consistent among elementary teachers. These findings implied a moderate level of engagement in using visual tools and interactive manipulatives to enhance math instruction and help learners better understand complex concepts.

**Table 10. Mean and Interpretations of the Technology-Aided Teaching Approaches in Mathematics of the Respondents in terms of Visual Aids and Manipulatives**

| Indicator | M | Interpretation | SD |
|---|---|---|---|
| 1. I use digital visual aids, like interactive number lines and charts, to help learners understand math concepts more clearly. | 2.89 | Moderately Evident | 1.005 |
| 2. I incorporate virtual manipulatives, such as online base-ten blocks or fraction bars, to allow learners to explore and visualize math ideas. | 2.85 | Moderately Evident | .960 |
| 3. I display colorful math diagrams and graphics on a smartboard to illustrate concepts like shapes, patterns, and number operations. | 2.90 | Moderately Evident | .989 |
| 4. I provide learners with access to interactive math tools, such as digital counters and measuring devices, to practice their skills hands-on. | 2.76 | Moderately Evident | 1.012 |

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|---|---|---|---|
| 5. I use educational videos with visual explanations and animations to reinforce math concepts and engage learners. | 3.00 | Moderately Evident | .905 |
| 6. I integrate digital whiteboards where learners can draw and manipulate math objects to solve problems and demonstrate their understanding. | 2.69 | Moderately Evident | 1.007 |
| 7. I create and use visual math games on tablets or computers that involve drag-and-drop activities and visual problem-solving. | 2.65 | Moderately Evident | 1.046 |
| 8. I incorporate virtual math manipulatives into lessons to help learners experiment with equations and geometric shapes. | 2.69 | Moderately Evident | 1.018 |
| 9. I use interactive math apps that offer visual feedback and animations to help learners grasp complex concepts through visual representation. | 2.64 | Moderately Evident | 1.014 |
| 10. I set up digital stations with visual aids and manipulatives for learners to explore math concepts independently or in small groups. | 2.64 | Moderately Evident | 1.025 |
| **General Mean Rating** | **2.77** | **Moderately Evident** | **.933** |

The implication of this study suggested that while technology-aided visual aids and manipulatives were moderately evident, there was room for enhancing the use of these tools to further engage learners and deepen their understanding of math concepts. Increasing the variety and interactivity of visual tools could potentially lead to more effective learning experiences and greater learner engagement in math. The findings of Serin (2023) aligned with the present study in suggesting that integrating visual aids and manipulatives through technology can enhance the clarity of math concepts and engage learners more effectively. Both studies imply that leveraging digital tools to provide visual feedback and interactive problem-solving opportunities can improve learner understanding and engagement in mathematics.

**4.2.4. Songs and Rhymes**

Table 11 showcases the mean and standard deviations of technology-aided teaching approaches in mathematics of the respondents in terms of songs and rhymes. The range of means (M) for each indicator in Table 10 was between 2.74 and 3.03, indicating that the technology-aided teaching approaches in songs and rhymes were moderately evident. The general mean rating for all indicators was 2.87, and the general standard deviation (SD) was 0.880, suggesting that the integration of songs and rhymes into math instruction was moderately consistent among elementary teachers. These findings implied a moderate level of engagement in using musical elements to make math learning more enjoyable and memorable for learners.

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**Table 11. Mean and Interpretations of the Technology-Aided Teaching Approaches in Mathematics of the Respondents in terms of Songs and Rhymes**

| Indicator | M | Interpretation | SD |
|---|---|---|---|
| 1. I use educational math songs and rhymes with interactive videos to help learners remember math facts and concepts. | 3.03 | Moderately Evident | .935 |
| 2. I integrate digital tools that play catchy math rhymes and songs during lessons to make learning math more engaging and fun. | 2.96 | Moderately Evident | .940 |
| 3. I create math-related music videos that include visual and auditory elements to teach concepts like counting or addition. | 2.79 | Moderately Evident | .947 |
| 4. I use apps and websites that feature math songs and rhymes to reinforce learning and provide learners with a rhythmic way to practice math skills. | 2.83 | Moderately Evident | .956 |
| 5. I encourage learners to sing along to math songs that explain multiplication tablets or geometric shapes, helping them to memorize and understand better. | 2.97 | Moderately Evident | .923 |
| 6. I encourage learners to sing along to math songs that explain multiplication tables or geometric shapes, helping them to memorize and understand better. | 2.98 | Moderately Evident | .917 |
| 7. I use music-based activities where learners create their own math songs or rhymes, using digital tools to record and share their creations. | 2.80 | Moderately Evident | .991 |
| 8. I incorporate math songs with simple digital karaoke setups, so learners can practice math concepts while singing along with the lyrics. | 2.74 | Moderately Evident | 1.028 |
| 9. I use online resources that combine math songs with interactive games, allowing learners to engage with math concepts through music and play. | 2.84 | Moderately Evident | .987 |
| 10. I incorporate digital storybooks with rhymes and songs that include math problems, helping learners to | 2.76 | Moderately Evident | 1.000 |

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|---|---|---|---|
| solve problems while enjoying a musical experience. | | | |
| **General Mean Rating** | **2.87** | **Moderately Evident** | **.880** |

The implication of this study suggested that while songs and rhymes were moderately evident in technology-aided teaching approaches, there was room for further enhancement. Increasing the use of digital tools and interactive musical content could potentially lead to more effective engagement and a deeper understanding of math concepts through an enjoyable and rhythmic learning experience. The findings of Setra and Sopian (2022) aligned with the present study in suggesting that incorporating songs and rhymes through technology can improve the memorization and understanding of math concepts among learners. Both studies imply that integrating music-based approaches can make learning more engaging and facilitate better retention of math skills through rhythmic and enjoyable methods.

### 4.3. Learners' Learning Motivation

#### 4.3.1. Providing Choice

Table 12 features the mean and standard deviations of learners' learning motivation in terms of providing choice as perceived by the respondents. The range of means (M) for each indicator in Table 12 was between 2.73 and 3.00, indicating that providing choice in learning activities was frequently observed among learners as perceived by the respondents. The general mean rating was 2.85, with a standard deviation (SD) of 0.900, suggesting a moderately positive impact on learners' motivation in choosing their preferred methods and activities for math learning. These results imply that when learners have the autonomy to select their own tasks and methods, they tend to be more engaged and motivated in their learning.

**Table 12. Mean and Interpretations of the Learners' Learning Motivation in terms of Providing Choice as Perceived by the Respondents**

| **Indicator** | **M** | **Interpretation** | **SD** |
|---|---|---|---|
| 1. My learners choose from different math activities that they enjoy, such as games or puzzles. | 3.00 | Frequently Observed | .953 |
| 2. My learners pick their favorite methods for solving math problems, whether it is using manipulatives or drawing pictures. | 2.92 | Frequently Observed | .932 |
| 3. My learners select from a variety of digital tools or apps to practice their math skills, making learning more fun and engaging. | 2.73 | Frequently Observed | .997 |
| 4. My learners choose which types of math challenges they want to tackle, allowing them to work on problems that interest them. | 2.85 | Frequently Observed | .983 |
| 5. My learners decide how they want to present their math projects, such as | 2.81 | Frequently Observed | .999 |

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| | | | |
|---|---|---|---|
| through a poster, a digital presentation, or a simple report. | | | |
| 6. My learners pick from different levels of difficulty for their math assignments, so they can work at their own pace and ability level. | 2.79 | Frequently Observed | .994 |
| 7. My learners choose which math topics they want to explore further based on their interests and curiosity. | 2.80 | Frequently Observed | .979 |
| 8. My learners select from various group or individual activities during math lessons, helping them stay engaged and motivates. | 2.91 | Frequently Observed | .913 |
| 9. My learners decide how they want to use their math time, whether they prefer to work on a group project or practice independently. | 2.82 | Frequently Observed | .948 |
| 10. My learners choose their preferred ways to solve math problems, like using a number line or drawing diagrams, to match their learning styles. | 2.83 | Frequently Observed | 1.003 |
| **General Mean Rating** | **2.85** | **Frequently Observed** | **.900** |

The implication of this study suggests that offering choice in math activities could enhance learners' motivation by allowing them to align tasks with their interests and preferred learning styles. This approach can lead to increased engagement and a deeper investment in the learning process. The findings of Moudden and Lamkhanter (2023) regarding learner autonomy and choice in learning activities are consistent with the present study. Both studies highlight that when learners have the freedom to make choices in their learning, it positively affects their motivation and engagement, suggesting that personalized learning strategies can be effective in fostering a more motivated learning environment.

#### 4.3.2. Involving Stories and Characters

Table 13 details the mean and standard deviations of learners' learning motivation in terms of involving stories and characters as perceived by the respondents. The means (M) for each indicator in Table 13 ranged from 2.69 to 2.95, indicating that involving stories and characters in math learning activities was frequently observed among learners as perceived by the respondents. The general mean rating was 2.79, with a standard deviation (SD) of 0.906, suggesting that these methods positively influenced learners' motivation in engaging with math content.

**Table 13. Mean and Interpretations of the Learners' Learning Motivation in terms of Involving Stories and Characters as Perceived by the Respondents**

| Indicator | M | Interpretation | SD |
|---|---|---|---|

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| | | | |
|---|---|---|---|
| 1. My learners listen to math stories with fun characters that help them understand different math concepts. | 2.95 | Frequently Observed | .964 |
| 2. My learners solve math problems that are part of a story involving characters they find interesting. | 2.92 | Frequently Observed | .920 |
| 3. My learners create their own math stories with characters, which makes learning math more exciting and personal. | 2.69 | Frequently Observed | .984 |
| 4. My learners follow along with interactive math stories where characters face math challenges, making the lessons more engaging. | 2.79 | Frequently Observed | .947 |
| 5. My learners use characters from stories to learn about math, helping them see how math fits into different situations. | 2.79 | Frequently Observed | .959 |
| 6. My learners talk about math problems within the context of stories and characters, which helps them understand math better. | 2.74 | Frequently Observed | .948 |
| 7. My learners act out math problems as characters from stories, which makes learning math more interactive and fun. | 2.78 | Frequently Observed | .997 |
| 8. My learners read math stories that include characters working through math problems, which keeps them interested and motivated. | 2.78 | Frequently Observed | .951 |
| 9. My learners choose their favorite characters and stories to help them solve math problems, connecting better with the material. | 2.76 | Frequently Observed | .942 |
| 10. learners use simple digital tools to create math stories with characters, which helps them visualize and understand math concepts. | 2.72 | Frequently Observed | .988 |
| **General Mean Rating** | **2.79** | **Frequently Observed** | **.906** |

The findings imply that integrating stories and characters into math instruction can enhance learners' motivation by making math more relatable and enjoyable. By associating math problems with narratives and characters, learners can better connect with the content and develop a deeper understanding of mathematical concepts. The results of this study align with the work of Sun (2022) on integrating storytelling in math education. Both studies underscore the effectiveness of

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using narratives and characters as a strategy to engage learners, foster motivation, and improve comprehension in math learning environments.

#### 4.3.3. Using Real-Life Contexts

Table 14 provides the mean and standard deviations of learners' learning motivation in terms of using real-life contexts as perceived by the respondents. The means (M) for each indicator in Table 14 ranged from 2.88 to 3.06, indicating that using real-life contexts to teach math was frequently observed among learners as perceived by the respondents. The general mean rating was 2.97, with a standard deviation (SD) of 0.890, suggesting that applying math to everyday activities significantly engaged learners and made the content more relevant to their lives.

**Table 14. Mean and Interpretations of the Learners' Learning Motivation in terms of Using Real-Life Contexts as Perceived by the Respondents**

| Indicator | M | Interpretation | SD |
|---|---|---|---|
| 1. My learners use math skills to solve problems related to everyday activities, like shopping or cooking. | 3.06 | Frequently Observed | .896 |
| 2. My learners apply math concepts to real-life situations, such as measuring ingredients for a recipe or calculating time for a game. | 3.01 | Frequently Observed | .923 |
| 3. My learners explore math through real-life examples, like figuring out how many chairs are needed for a party or how much paint is needed for a wall. | 2.97 | Frequently Observed | .923 |
| 4. My learners connect math problems to their daily routines, such as planning a party or organizing their classroom supplies. | 2.97 | Frequently Observed | .947 |
| 5. My learners use math to solve real-word challenges, like determining how many books they can fit on a shelf or how many pieces of fruit are in a basket. | 2.97 | Frequently Observed | .935 |
| 6. My learners participate in activities where they use math to make decisions in real-life scenarios, like choosing the best deal when shopping. | 2.94 | Frequently Observed | .921 |
| 7. My learners solve math problems based on real-life stories, like helping characters with their daily tasks or adventures. | 3.00 | Frequently Observed | .929 |
| 8. My learners use math to measure and compare objectives in their environment, such as the height of their plants or the length of their classroom. | 2.96 | Frequently Observed | .940 |

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| | | | |
|---|---|---|---|
| 9. My learners apply math skills to real-life projects, like creating a simple budget for a classroom event or calculating distances for a field trip. | 2.88 | Frequently Observed | .975 |
| 10. My learners relate math lessons to their experiences, such as figuring out how much time is left before recess or how many steps it takes to walk to school. | 2.97 | Frequently Observed | .994 |
| **General Mean Rating** | **2.97** | **Frequently Observed** | **.890** |

The findings suggest that real-life applications of math help learners see the practical use of mathematical concepts and develop problem-solving skills that they can use in everyday situations. By connecting math problems with real-world scenarios, learners are likely to find the subject more meaningful and enjoyable, which can enhance their motivation and engagement. These results are in line with the research by Amalia, Makmuri, and Hakim (2024), which also emphasized the importance of contextualizing math problems in real-life situations to boost learner motivation and understanding. Both studies highlight the effectiveness of applying math to practical scenarios to help learners relate to the material and apply their knowledge beyond the classroom.

### 4.3.4. Celebrating Successes

Table 15 presents the mean and standard deviations of learners' learning motivation in terms of celebrating successes as perceived by the respondents. The means (M) for each indicator in Table 15 ranged from 2.98 to 3.20, indicating that celebrating successes was frequently observed among learners as perceived by the respondents. The general mean rating was 3.11, with a standard deviation (SD) of 0.882, suggesting that recognizing and celebrating achievements significantly motivated learners to engage in math activities and pursue their learning goals.

**Table 15. Mean and Interpretations of the Learners' Learning Motivation in terms of Celebrating Successes as Perceived by the Respondents**

| Indicator | M | Interpretation | SD |
|---|---|---|---|
| 1. My learners receive praise and recognition for their achievements in solving math problems correctly. | 3.20 | Frequently Observed | .919 |
| 2. My learners celebrate their progress with small rewards, like stickers or extra playtime, for reaching math goals. | 3.15 | Frequently Observed | .936 |
| 3. My learners share their math successes with classmates during class time, boosting their confidence and motivation. | 3.17 | Frequently Observed | .920 |
| 4. My learners participate in fun math challenges where they get to show off their skills and earn certificates or awards. | 3.09 | Frequently Observed | .925 |

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| | | | |
|---|---|---|---|
| 5. My learners have their math work displayed on a success board in the classroom to celebrate their hard work and progress. | 3.09 | Frequently Observed | .913 |
| 6. My learners enjoy special classroom activities or games when they reach math milestones or complete a challenging task. | 3.13 | Frequently Observed | .932 |
| 7. My learners receive positive feedback from their peers and teachers for their effort and success in math activities. | 3.16 | Frequently Observed | .916 |
| 8. My learners take part in group celebrations, like a math party or a class cheer, to honor their collective achievements in learning math. | 3.02 | Frequently Observed | .953 |
| 9. My learners reflect of their math successes with a learning journal where they write or draw about their achievements and progress. | 2.98 | Frequently Observed | .965 |
| 10. My learners are encouraged to set and celebrate personal math goals, with recognition for each goal they achieve. | 3.09 | Frequently Observed | .913 |
| **General Mean Rating** | **3.11** | **Frequently Observed** | **.882** |

The findings indicate that providing positive reinforcement, such as praise, rewards, and opportunities for group celebrations, enhances learners' confidence and motivation. When learners are recognized for their math successes, they are more likely to feel accomplished and motivated to continue their efforts, contributing to a positive learning environment. These results align with studies by Faristin, Yuniawatika, and Murdiyah (2022), which found that acknowledgment and positive reinforcement play a crucial role in fostering motivation and engagement in learning. By celebrating successes, learners are encouraged to set and achieve goals, which in turn boosts their self-esteem and enthusiasm for learning.

**4.4. Difference Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Profile**

**4.4.1. Age**

In Table 16, the difference between the technology-aided teaching approaches in mathematics of the respondents across different age groups was examined. The table presents the values of H (1.171), degrees of freedom (df = 3), and the p-value (.760) to assess the statistical significance of the differences among the age groups (20-29 years old, 30-39 years old, 40-49 years old, and 50-59 years old). The decision to accept the null hypothesis (H0) indicated that there was no statistically significant difference in technology-aided teaching approaches in mathematics among the different age groups. This suggested that age did not significantly influence how

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respondents utilized technology in teaching mathematics. The interpretation was that the use of technology in teaching mathematics was consistent across these age groups.

**Table 16. Difference Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Age**

| Groups | H | df | P | Decision |
|---|---|---|---|---|
| 20-29 years old | 1.171 | 3 | .760 | Accept $H_0$ |
| 30-39 years old | | | | Not |
| 40-49 years old | | | | Significant |
| 50-59 years old | | | | |

The implication of this study was that technology-aided teaching approaches were universally applicable, regardless of the respondent's age, indicating that such methods could be effectively used across different demographic segments without significant variation in implementation. The findings of Gibson and Owens (2023), which highlighted that technology-aided teaching approaches were effective across various age groups, were consistent with the present study, reinforcing the idea that these methods were adaptable and beneficial in diverse teaching contexts.

### 4.4.2. Gender

In Table 17, the difference between the technology-aided teaching approaches in mathematics of the respondents across different gender groups was demonstrated. The table presents the values of H (1.251), degrees of freedom (df = 2), and the p-value (.535) to assess the statistical significance of the differences among the gender groups (Male, Female, LGBTQIA+). The decision to accept the null hypothesis (H0) indicated that there was no statistically significant difference in technology-aided teaching approaches in mathematics among the different gender groups. This suggested that gender did not significantly influence how respondents utilized technology in teaching mathematics. The interpretation was that the use of technology in teaching mathematics was consistent across these gender groups.

**Table 17. Difference Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Gender**

| Groups | H | df | P | Decision |
|---|---|---|---|---|
| Male | 1.251 | 2 | .535 | Accept $H_0$ |
| Female | | | | Not |
| LGBTQIA+ | | | | Significant |

The implication of this study was that technology-aided teaching approaches were universally applicable, irrespective of the respondent's gender, indicating that such methods could be effectively used across diverse demographic segments without significant variation in implementation. The findings of Alieto, Abequibel-Encarnacion, Estigoy, Balasa, Eijansantos, and Torres-Toukoumidis (2024), which showed that technology-aided teaching approaches were effective across various gender groups, were consistent with the present study, reinforcing the idea that these methods were adaptable and beneficial in diverse teaching contexts.

### 4.4.3. Grade Assignment

In Table 18, the difference between the technology-aided teaching approaches in mathematics of the respondents across different grade assignment groups was expounded. The table presents the values of H (2.400), degrees of freedom (df = 2), and the p-value (.301) to assess

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the statistical significance of the differences among the grade assignment groups (Kindergarten, Primary Grade, Intermediate Grade). The decision to accept the null hypothesis (H0) indicated that there was no statistically significant difference in technology-aided teaching approaches in mathematics among the different grade assignment groups. This suggested that grade assignment did not significantly influence how respondents utilized technology in teaching mathematics. The interpretation was that the use of technology in teaching mathematics was consistent across these grade assignment groups.

**Table 18. Difference Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Grade Assignment**

| Groups | H | df | P | Decision |
|---|---|---|---|---|
| Kindergarten | 2.400 | 2 | .301 | Accept $H_0$ |
| Primary Grade | | | | Not |
| Intermediate Grade | | | | Significant |

The implication of this study was that technology-aided teaching approaches were universally applicable, irrespective of the respondent's grade assignment, indicating that such methods could be effectively used across different educational levels without significant variation in implementation. The findings of Cavus and Deniz (2021), which highlighted that technology-aided teaching approaches were effective across various grade assignments, were consistent with the present study, reinforcing the idea that these methods were adaptable and beneficial in diverse teaching contexts.

**4.4.4. Teaching Position**

In Table 19, the difference between the technology-aided teaching approaches in mathematics of the respondents across different teaching position groups was depicted. The table presents the values of H (4.338), degrees of freedom (df = 5), and the p-value (.502) to assess the statistical significance of the differences among the teaching position groups (Contractual Teacher, Teacher I, Teacher II, Teacher III, Master Teacher I, Master Teacher II). The decision to accept the null hypothesis (H0) indicated that there was no statistically significant difference in technology-aided teaching approaches in mathematics among the different teaching position groups. This suggested that the teaching position did not significantly influence how respondents utilized technology in teaching mathematics. The interpretation was that the use of technology in teaching mathematics was consistent across these teaching position groups.

**Table 19. Difference Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Teaching Position**

| Groups | H | df | P | Decision |
|---|---|---|---|---|
| Contractual Teacher | 4.338 | 5 | .502 | Accept $H_0$ |
| Teacher I | | | | Not |
| Teacher II | | | | Significant |
| Teacher III | | | | |
| Master Teacher I | | | | |
| Master Teacher II | | | | |

The implication of this study was that technology-aided teaching approaches were universally applicable, irrespective of the respondent's teaching position, indicating that such

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methods could be effectively used across different levels of teaching roles without significant variation in implementation. The findings of Schmid, Borokhovski, Bernard, Pickup, and Abrami (2023), which showed that technology-aided teaching approaches were effective across various teaching positions, were consistent with the present study, reinforcing the idea that these methods were adaptable and beneficial in diverse teaching contexts.

#### 4.4.5. Length of Service

In Table 20, the difference between the technology-aided teaching approaches in mathematics of the respondents across different length of service groups was assessed. The table presents the values of H (.823), degrees of freedom (df = 3), and the p-value (.844) to assess the statistical significance of the differences among the length of service groups (0-9 years, 10-19 years, 20-29 years, 30 years and above). The decision to accept the null hypothesis (H0) indicated that there was no statistically significant difference in technology-aided teaching approaches in mathematics among the different length of service groups. This suggested that the length of service did not significantly influence how respondents utilized technology in teaching mathematics. The interpretation was that the use of technology in teaching mathematics was consistent across these length of service groups.

**Table 20. Difference Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Length of Service**

| Groups | H | df | P | Decision |
|---|---|---|---|---|
| 0-9 years | .823 | 3 | .844 | Accept $H_0$ |
| 10-19 years | | | | Not |
| 20-29 years | | | | Significant |
| 30 years and above | | | | |

The implication of this study was that technology-aided teaching approaches were universally applicable, irrespective of the respondent's length of service, indicating that such methods could be effectively used across different career stages without significant variation in implementation. The findings of Mitchell and Ivimey-Cook (2023), which highlighted that technology-aided teaching approaches were effective across various lengths of service, were consistent with the present study, reinforcing the idea that these methods were adaptable and beneficial in diverse teaching contexts.

#### 4.4.6. Highest Educational Attainment

In Table 21, the difference between the technology-aided teaching approaches in mathematics of the respondents across different highest educational attainment groups was evaluated. The table presents the values of H (2.958), degrees of freedom (df = 5), and the p-value (.706) to assess the statistical significance of the differences among the educational attainment groups (with Education units, Education Graduate, with Master’s units, Master’s Graduate, with Doctorate units, Doctorate Graduate). The decision to accept the null hypothesis (H0) indicated that there was no statistically significant difference in technology-aided teaching approaches in mathematics among the different highest educational attainment groups. This suggested that the highest educational attainment did not significantly influence how respondents utilized technology in teaching mathematics. The interpretation was that the use of technology in teaching mathematics was consistent across these educational attainment groups.

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**Table 21. Difference Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Highest Educational Attainment**

| Groups | H | df | P | Decision |
|---|---|---|---|---|
| with Education units | 2.958 | 5 | .706 | Accept $H_0$ |
| Education Graduate | | | | Not |
| With Master's units | | | | Significant |
| Master's Graduate | | | | |
| with Doctorate units | | | | |
| Doctorate Graduate | | | | |

The implication of this study was that technology-aided teaching approaches were universally applicable, irrespective of the respondent's highest educational attainment, indicating that such methods could be effectively used across different levels of educational qualifications without significant variation in implementation. The findings of Kucuk and Kucuk (2023), which showed that technology-aided teaching approaches were effective across various educational attainment levels, were consistent with the present study, reinforcing the idea that these methods were adaptable and beneficial in diverse teaching contexts.

**4.4.7. Number of Training Sessions Attended in Technology-Aided Teaching**

In Table 22, the difference between the technology-aided teaching approaches in mathematics of the respondents across different numbers of training sessions attended in technology-aided teaching was elucidated. The table presents the values of H (7.090), degrees of freedom (df = 6), and the p-value (.313) to assess the statistical significance of the differences among the training session groups (None, 1-2, 3-4, 5-6, 7-8, 9-10, 11 and above). The decision to accept the null hypothesis (H0) indicated that there was no statistically significant difference in technology-aided teaching approaches in mathematics among the different numbers of training sessions attended. This suggested that the number of training sessions did not significantly influence how respondents utilized technology in teaching mathematics. The interpretation was that the use of technology in teaching mathematics was consistent across these training session groups.

**Table 22. Difference Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Number of Training Sessions Attended in Technology-Aided Teaching**

| Groups | H | df | P | Decision |
|---|---|---|---|---|
| None | 7.090 | 6 | .313 | Accept $H_0$ |
| 1-2 | | | | Not |
| 3-4 | | | | Significant |
| 5-6 | | | | |
| 7-8 | | | | |
| 9-10 | | | | |
| 11 and above | | | | |

The implication of this study was that technology-aided teaching approaches were universally applicable, irrespective of the number of training sessions attended, indicating that such methods could be effectively used regardless of previous training exposure. The findings of

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Sitthiworachart, Joy, King, Sinclair, and Foss (2022), which highlighted that technology-aided teaching approaches were effective across various levels of training exposure, were consistent with the present study, reinforcing the idea that these methods were adaptable and beneficial in diverse teaching contexts.

**4.5. Correlation Between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Learners' Learning Motivation**

Table 23 showcases the Spearman's Rho Coefficient correlation used to evaluate the correlation between the technology-aided teaching approaches in mathematics and learners' learning motivation among the respondents. The correlation coefficient between technology-aided teaching approaches in mathematics and learners' learning motivation is .852, indicating a very high positive correlation. The significance level (Sig. 2-tailed) is .000, which is less than 0.05, leading to the rejection of the null hypothesis. This signifies a statistically significant correlation between the two variables.

**Table 23. Spearman's Rho Coefficient Correlation to Test the Correlation between the Technology-Aided Teaching Approaches in Mathematics of the Respondents and Their Learners' Learning Motivation**

| Sources of Correlation (Spearman's Rho) | | Technology-Aided Teaching Approaches in Mathematics | Learners' Learning Motivation | Decision/ Interpretation |
|---|---|---|---|---|
| Technology-Aided Teaching Approaches in Mathematics | Correlation Coefficient | 1.000 | .852 | **Very High Positive Correlation Reject $H_0$ Significant** |
| | Sig. (2-tailed) | | .000 | |
| | N | 89 | 89 | |
| Learners' Learning Motivation | Correlation Coefficient | .852 | 1.000 | |
| | Sig. (2-tailed) | .000 | | |
| | N | 89 | 89 | |

The high positive correlation suggests that as technology-aided teaching approaches in mathematics increase, learners' motivation also tends to improve, highlighting the effectiveness of these approaches in enhancing learner engagement and motivation in learning. The findings of Panakaje, Rahiman, Parvin, Yatheen, and Irfana (2024), which showed a significant correlation between instructional methods and learner motivation, align with the present study's results, reinforcing the importance of integrating technology into teaching practices to boost learners' motivation.

**4.6. An Education 5.0-Inspired Instructional Program to Enhance the Technology-Aided Approaches in Mathematics of the Elementary Teachers and Their Learners' Learning Motivation**

The Education 5.0-Inspired Instructional Program aims to address critical gaps in technology-aided teaching approaches in Mathematics among elementary teachers and enhance learners' motivation. This initiative stems from the increasing need for teachers to adapt to innovative strategies that integrate technology, ensuring teaching practices align with 21st-century learning standards. The program is particularly significant as it addresses moderate consistency in the implementation of these approaches, limited training exposure, and the underutilization of play-based learning methods. By aligning professional development activities with teachers' unique profiles and promoting strategies that sustain learner motivation, the program fosters a holistic improvement in teaching and learning. Ultimately, this endeavor seeks to empower teachers and inspire learners, contributing to a transformative and engaging educational experience.

**5. CONCLUSIONS**

1. Elementary teachers predominantly belonged to the age group of 30-39 years old, were mostly female, and handled intermediate classes. They held Teacher III positions, had served for 10-19 years, attained master's units, and attended only 1-2 training sessions in technology-aided teaching.
2. The implementation of technology-aided teaching approaches in mathematics, such as play-based learning, math stations and centers, visual aids and manipulatives, and songs and rhymes, was found to be moderately consistent and moderately evident among the elementary teachers.
3. Elementary teachers positively and consistently observed their learners' learning motivation through strategies such as providing choices, involving stories and characters, using real-life contexts, and celebrating successes, with these practices frequently observed in classrooms.
4. There was no significant difference between the technology-aided teaching approaches in mathematics of elementary teachers and their demographic profiles, including age, gender, grade assignment, teaching position, length of service, highest educational attainment, and number of training sessions attended.
5. A very high positive significant correlation was identified between the technology-aided teaching approaches in mathematics employed by the respondents and their learners' learning motivation, underscoring the strong link between effective teaching strategies and learner engagement.
6. An Education 5.0-inspired instructional program was developed to enhance the technology-aided teaching approaches in mathematics of elementary teachers and to further improve learners' learning motivation, addressing identified gaps and challenges in teaching practices.

**6. RECOMMENDATIONS**

1. Schools and educational divisions should prioritize providing additional training opportunities for teachers, especially those with limited exposure to technology-aided teaching, to enhance their professional development and instructional effectiveness.
2. Teachers should adopt structured lesson plans incorporating technology-aided strategies, such as play-based learning and visual aids, to ensure more consistent and evident implementation in mathematics instruction.
3. Teachers should continue utilizing motivation-enhancing strategies, such as integrating real-life contexts and celebrating successes, while exploring additional approaches to sustain and improve learner engagement.
4. Training programs should be designed to align with teachers' diverse profiles and professional needs, ensuring that all teachers, regardless of their demographic characteristics, have equal opportunities to develop their technology-aided teaching competencies.
5. Teachers should regularly assess the impact of their technology-aided teaching approaches on learners' motivation to refine and maximize the effectiveness of these strategies in fostering engagement and learning.

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6. Schools should implement the crafted Education 5.0-inspired instructional program, monitor its outcomes, and make adjustments based on teacher and learner feedback to continually improve the integration of technology-aided approaches in mathematics.
7. Further studies on the long-term impact of technology-aided teaching approaches on learners' academic performance and retention in mathematics should be conducted to provide deeper insights into their effectiveness and sustainability.

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