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JOURNAL FOR THE ADVANCEMENT OF SUSTAINABLE DEVELOPMENT GOALS
AN INTERNATIONAL, PEER-REVIEWED, OPEN ACCESS JOURNAL
www.jasdg.com
Volume 1 Issue 4 Pages 4217-4233
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24294992

SOLVING THROUGH STORIES: A DIGITAL STORYTELLING APPROACH TO ENHANCE STUDENTS' ACADEMIC ACHIEVEMENT

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ABSTRACT

This action research examined the effectiveness of the Digital Storytelling Approach in enhancing the academic performance of Grade 11 students enrolled in Shielded Metal Arc Welding (SMAW) within General Mathematics at a public secondary school in the Diplahan District during School Year 2024–2025. The study employed a quasi-experimental, one-group pretest–posttest design involving 37 students selected through total enumeration. The instructional material, "Liza's Overtime Challenge," was adapted and contextualized from the DepEd General Mathematics Module to reflect real-life situations relevant to Technical-Vocational-Livelihood (TVL) learners. Validated and reliable pretest and posttest instruments were administered to assess students' mastery of competencies in calculating wages, overtime, and commissions. Findings indicated a significant improvement in performance, as the mean score increased from 6.00 (MPS = 50%) in the pretest to 14.30 (MPS = 95%) in the posttest. The Wilcoxon signed-rank test ($p = 0.041$) indicated a statistically significant difference, confirming that the Digital Storytelling Approach effectively enhanced students' mathematical understanding and engagement. The study concludes that integrating digital storytelling into mathematics instruction fosters deeper comprehension, greater motivation, and meaningful learning experiences. It is recommended that teachers adopt this approach to design interactive, contextualized, and technology-enhanced lessons that strengthen both numeracy and digital literacy skills.

Keywords: *Academic Achievement, Contextualized Instruction, Digital Storytelling, Mathematics, SMAW Students*

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INTRODUCTION

Background of the Study

Mathematics has long been recognized as one of the most challenging subjects for students across all educational levels. Many learners find it difficult to grasp abstract concepts and apply mathematical reasoning to real-life situations. Traditional teaching approaches, which often rely heavily on lectures and rote memorization, fail to address the diverse learning needs of students. As a result, disengagement, math anxiety, and low academic performance continue to persist. To overcome these challenges, educators are increasingly adopting innovative, technology-enhanced, and learner-centered strategies aimed at making mathematics learning more meaningful, relevant, and enjoyable.

International assessments have repeatedly drawn attention to the Philippines' difficulties in achieving mathematical proficiency. Of the seventy-nine participating countries in the Programme for International Student Assessment (PISA 2018), the country ranked lowest in mathematics, and over 80% of learners performed below the required competency level (Organisation for Economic Co-operation and Development [OECD], 2019). Similarly, the Philippines ranked last among fifty-eight nations in the Trends in International Mathematics and Science Study (TIMSS 2019) (International Association for the Evaluation of Educational Achievement [IEA], 2020). These outcomes reflect a persistent gap in students' numeracy skills, conceptual understanding, and problem-solving proficiency. Salinas and Balagtas (2021) further reported that 62% of Filipino high school students experience moderate to high levels of math anxiety, which negatively affects motivation and achievement.

As a result, the Department of Education (DepEd) has started national programs within the MATATAG Curriculum Framework, such as the National Learning Recovery Program (NLRP), Hamon: Bawat Bata Bumabasa (3Bs Initiative), and Bawat Bata Bumabasa sa Matatag na Kinabukasan (BBB sa MK). These programs aim to strengthen literacy and numeracy, close learning gaps caused by the pandemic, and promote inclusive, contextualized instruction. Despite these efforts, however, learners, particularly those in the Technical-Vocational-Livelihood (TVL) track, continue to face difficulties in mastering mathematical concepts and applying them in real-world, work-related contexts (Philippine Institute for Development Studies [PIDS], 2021). The present study aligns with these national efforts by integrating Digital Storytelling as a learner-centered innovation that supports the MATATAG Curriculum's goal of strengthening numeracy through contextualized, technology-enhanced instruction. Likewise, it contributes to the NLRP by addressing learning loss in mathematics through engaging, narrative-based digital content that promotes motivation, comprehension, and real-world application. This alignment ensures that the intervention is not only innovative but also responsive to the Department's priority thrusts on learning recovery and quality instruction.

At one school in the Diplahan District, where the TVL track is offered, mathematics remains among the least mastered subjects. School data show that the Mean Percentage Score (MPS) in General Mathematics was 58.84% in School Year 2022–2023 and 56.45% in School Year 2023–2024, both within the *"Did Not Meet Expectations"* range (50–74%). This indicates persistent difficulty among learners, especially those in the Shielded Metal Arc Welding (SMAW) specialization, in applying mathematical concepts to authentic, work-based situations. Specifically, 37 Grade 11 SMAW students participated in the implementation of the Digital Storytelling Approach; stating this figure establishes the scope, coverage, and context of the study population.

To address these contextual needs, this study introduced a Digital Storytelling innovation titled *"Liza's Overtime Challenge,"* adapted and contextualized from the DepEd General Mathematics Module (Unit 3: Wages, Overtime, and Commission) (Bureau of Learning Resources, 2016). The story mirrors work-related contexts familiar to SMAW students, such as computing wages, overtime pay, and commissions, enabling them to connect mathematical lessons to real-life experiences. This approach fulfills Section 5 of Republic Act No. 10533 (2013), which mandates that "the curriculum shall be contextualized and global, allowing schools to localize, indigenize, and enhance instruction."

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Through this innovation, the study aimed to enhance student engagement, deepen conceptual understanding, and reduce math anxiety by presenting lessons in meaningful, authentic contexts. Ultimately, this action research aimed to evaluate the effectiveness of the Digital Storytelling Approach in enhancing students' academic achievement in mathematics. The findings are expected to contribute to evidence-based practices that promote numeracy, digital literacy, and contextualized learning among students in the TVL strand.

Review of Related Literature

Digital Storytelling in Mathematics Education

To bridge this gap, educators have turned to innovative teaching strategies that merge technology and storytelling. One such method is Digital Storytelling (DS), which integrates narrative techniques with multimedia elements such as text, audio, video, and images (Robin, 2008). Lambert (2013) asserts that DS helps learners connect emotionally and cognitively with content, making abstract concepts more tangible and personally meaningful. In mathematics education, DS has been shown to convert abstract numbers into contextualized narratives, encouraging students to engage more deeply in problem-solving (Kocaman-Karoglu, 2016). Similarly, Al Khateeb (2019) found that students taught through DS demonstrated higher motivation and better retention compared with those taught through traditional methods. Digital storytelling also supports the development of 21st-century competencies, including communication, collaboration, creativity, and critical thinking (Nguyen et al., 2014). Hung et al. (2012) further reported that project-based DS activities significantly enhance learning achievement and problem-solving competence. When effectively implemented, DS not only improves academic outcomes but also reduces math anxiety by allowing learners to explore mathematical ideas through relatable contexts (Yang & Wu, 2012).

Theoretical Foundations

The innovation is grounded in Jerome Bruner's Constructivist Theory, which posits that learners actively construct knowledge through meaningful contexts, emphasizing discovery and understanding rather than memorization (Bruner, 1961). Albert Bandura's Social Learning Theory, on the other hand, highlights that individuals learn by observing, imitating, and modeling behaviors demonstrated by others (Bandura, 1977). Within the digital storytelling framework, students observe characters performing mathematical tasks, thereby internalizing problem-solving strategies that they can replicate and adapt in similar problem situations. Mayer's (2005) Cognitive Theory of Multimedia Learning further emphasizes that learning is enhanced when information is presented through both visual and verbal modalities.

Legal and Policy Context

This innovation corresponds with Republic Act No. 10533, referred to as the Enhanced Basic Education Act of 2013, which advocates contextualized, learner-centered, and technology-integrated instruction (Republic Act No. 10533, 2013). It also supports the DepEd MATATAG Curriculum's goal of fostering functional literacy and numeracy through meaningful real-life applications. Furthermore, the innovation aligns with DepEd Order No. 16, s. 2017 (*Research Management Guidelines*), which promotes classroom-based innovations that enhance learning outcomes through evidence-based practices (Department of Education, 2017). It also supports DepEd Order No. 42, s. 2016 (*Policy Guidelines on Daily Lesson Preparation for the K to 12 Basic Education Program*), which encourages teachers to utilize interactive, contextualized, and technology-enhanced strategies to achieve learning competencies effectively.

Related Local Studies

Pespeñan and Cababat (2023) found that TVL students often perform below expected proficiency levels in analytical and numerical reasoning, underscoring the need for instructional innovation. Local studies further affirm the potential of narrative-based instruction. In their study *"Leveraging SNR (Stories and Reflection) to Boost Students' Behavior and Emotional Understanding,"* Bathan and Bathan (2025) found that story-driven reflection activities enhanced empathy, self-regulation, and emotional understanding among learners in the Buug District, Zamboanga Sibugay. Their findings suggest that storytelling can serve as a transformative educational

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tool that fosters both emotional engagement and cognitive growth, principles applicable to mathematics learning through digital narratives.

Conceptual Framework

To provide a more precise visualization of the research flow, the study presents a conceptual framework that illustrates the relationships among the variables. The model describes how the Input (Digital Storytelling Intervention) undergoes the Process (implementation through contextualized lessons, assessments, and student engagement activities) to produce the Output (improved academic performance and increased engagement in mathematics). This diagrammatic representation enhances the logical clarity and overall presentation of the research design, making it easier to understand the flow of the intervention and its outcomes.

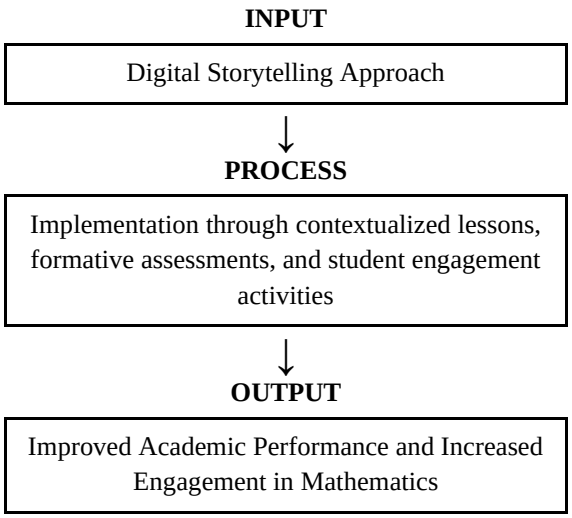


Figure 1. Conceptual Paradigm of the Study

Statement of the Problem

This study aimed to determine whether digital storytelling is effective in improving the academic achievement of Grade 11 Shielded Metal Arc Welding (SMAW) students in one school in the Diplahan District during School Year 2024–2025.

Specifically, this study sought to answer the following action research questions:

1. What is the mean score or academic achievement of Grade 11 SMAW students in mathematics before the conduct of digital storytelling?
2. What is the mean score or academic achievement of Grade 11 SMAW students in mathematics after the implementation of digital storytelling?
3. Is there a significant difference in the mean scores or academic achievement of Grade 11 SMAW students in mathematics before and after the conduct of digital storytelling?

Extent and Limitations

The innovation was implemented over a one-quarter period and covered one learning competency under Unit 3 of the General Mathematics curriculum. It focused specifically on Grade 11 SMAW students in one school within the Diplahan District. While the results provide strong evidence of the approach's effectiveness, the findings are limited to this specific group and context. Broader implementation across other strands or mathematical topics is recommended to further validate its generalizability.

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METHODS

Research Design

This research utilized a quasi-experimental framework, specifically a one-group pretest–posttest design, to evaluate the effectiveness of the Digital Storytelling Approach in enhancing the academic performance of Grade 11 students enrolled in Shielded Metal Arc Welding (SMAW) within General Mathematics at a public secondary school located in the Diplahan District for the academic year 2024–2025. Data were gathered using an adapted questionnaire that was administered both before and after the Digital Storytelling intervention. A comparison of pretest and posttest results was conducted to determine any significant differences between the two assessments. The exclusively quantitative approach allowed for objective measurement and statistical analysis, highlighting the influence of Digital Storytelling on students' academic outcomes.

Research Environment

This research was conducted in Zamboanga Sibugay during the first quarter of School Year 2024–2025, at a public secondary school in the Diplahan District that offers the Technical-Vocational-Livelihood (TVL) track. The researcher, who also served as the mathematics teacher, implemented the Digital Storytelling Approach in General Mathematics instruction.

Participants of the Study

The participants were Grade 11 Shielded Metal Arc Welding (SMAW) students under the TVL track. Using the total enumeration method, all 37 students enrolled in the class were included as participants, ensuring complete representation of the population and allowing for accurate and comprehensive measurement of the intervention's effects. Table 1 presents the respondents of the study.

Table 1. The Respondents of the Research

Grade Level and Section	No. of Respondents	
	Pre-test	Post-test
Grade 11 Shielded Metal Arc Welding (SMAW)	37	37

Innovation, Intervention, and Strategy

This action research introduced an innovative instructional approach to enhance mathematics achievement through Digital Storytelling (DS). The study aimed to make mathematics more engaging, contextualized, and meaningful for Grade 11 SMAW students by integrating digital narratives into the teaching of *Wages, Overtime, and Commission* in General Mathematics.

Innovation. The core innovation of this study was the Digital Storytelling Approach, which merges the narrative power of stories with multimedia tools to create rich, interactive learning experiences. This method employs stories, whether fictional or grounded in real-life contexts, supported by digital elements such as video, audio narration, animations, and visual graphics to illustrate mathematical ideas and real-world applications. For this study, the digital storytelling material titled *"Liza's Overtime Challenge"* was adapted and contextualized from the DepEd General Mathematics Module (Unit 3: Wages, Overtime, and Commission). The material was validated through the DepEd Learning Resources Management and Development System (LRMDS) to ensure alignment with the K to 12 Curriculum Guide (Department of Education, 2016) and the integrity of learning competencies. This ensured that instructional standards, content validity, and curricular relevance were maintained while contextualizing the lesson for TVL learners.

Intervention and Strategy. The intervention involved the integration of the digital storytelling video into the lesson sequence during the first quarter of the academic year. The story was presented as both a motivational activity and a core instructional tool. It introduced realistic scenarios involving wages, overtime, and commissions,

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mirroring work-related experiences familiar to SMAW students. Following the video presentation, students participated in guided discussions, problem-solving exercises, and practice activities that reinforced the mathematical concepts introduced in the story. This structured approach enabled learners to connect narrative events with mathematical operations, thereby strengthening comprehension and retention.

The digital storytelling strategy aimed to sustain student interest through emotional and visual engagement, reduce math anxiety by situating abstract concepts in relatable, concrete situations, and improve academic performance by fostering a deeper understanding and meaningful application of mathematical principles. Through this innovation, mathematics was presented not merely as an abstract subject but as a practical and essential life skill, particularly relevant to the learners' vocational and future employment contexts.

Research Instrument

Data were gathered using quantitative tools aimed at assessing the impact of the Digital Storytelling Approach on students' performance in mathematics. Two primary instruments were used: a pretest and a posttest, both aligned with the Most Essential Learning Competency (MELC) for General Mathematics: *"Calculate weekly or monthly wages from an annual salary, wages from an hourly rate (including situations involving overtime and other allowances), and earnings based on commission or piecework."* This competency was selected due to students' observed difficulty in applying mathematical concepts to real-life financial contexts such as salaries, overtime, deductions, and commissions. The study particularly focused on students' mastery of the competency related to computing wages, overtime, and commissions, a skill area previously identified as a least-learned competency based on the school's Mean Percentage Score (MPS) data from the last two school years.

The pretest and posttest each consisted of 15 multiple-choice items, classified according to Bloom's Revised Taxonomy to assess varying levels of cognition: remembering, understanding, and applying. All test items were contextualized to mirror real-world, work-related situations relevant to SMAW learners, such as calculating earnings, overtime pay, and deductions. The instrument and the digital story on which it is based are presented in Appendix G.

To ensure the validity and reliability of the instruments, the researcher followed DepEd's research quality assurance standards. Three subject-matter experts validated the test instruments: a Master Teacher I (English, Senior High School), who evaluated grammar, clarity, and comprehensibility; a Head Teacher IV (Mathematics), who assessed content validity, alignment with the MELCs, and cognitive demand; and an ICT Coordinator (Senior High School), who reviewed the technical and digital storytelling aspects to ensure instructional alignment with the learning objectives. A Content Validity Evaluation Form adapted from DepEd Order No. 16, s. 2017 (*Research Management Guidelines*) was used, applying a four-point Likert scale (1 = Not Valid to 4 = Highly Valid). Items with scores below 3.50 were revised based on the validators' feedback.

For reliability, the instrument underwent pilot testing among a comparable group of Grade 11 students who were not involved in the actual study. The Kuder–Richardson Formula 20 (KR-20) yielded a reliability coefficient of 0.87, indicating high internal consistency and confirming the instrument's dependability in assessing students' mathematical performance (see Appendix H).

Data-Gathering Procedure

The participants first completed a pretest, followed by instruction using the Digital Storytelling Approach as described under Innovation, Intervention, and Strategy. After the intervention, a posttest was administered to determine whether there was a significant improvement in their academic achievement. All research activities were carried out during regular class hours with the approval and supervision of the school administration to ensure minimal disruption to instruction. The schedule of activities is presented in the Action Plan.

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Data Analysis

This study employed a quasi-experimental one-group pretest–posttest design to determine the effectiveness of the Digital Storytelling Approach in improving students' mathematical achievement. The single group acted as the experimental group and was exposed to the digital storytelling intervention.

Descriptive statistics, namely the mean, standard deviation, and percentage, were used to summarize students' performance. The Mean Percentage Score (MPS) was interpreted using the DepEd Memorandum No. 160, s. 2012 standards (Department of Education, 2012), as shown in Table 2.

Table 2. Descriptive Equivalents of the Mean Percentage Score (MPS)

MPS Range	Descriptive Equivalent
96–100%	Mastered
86–95%	Closely Approximating Mastery
66–85%	Moving Towards Mastery
35–65%	Average
15–34%	Low
5–14%	Very Low
0–4%	Absolutely No Mastery

To assess the levels of student engagement during the implementation phase, the following theoretical mean ranges were established: 1.00–1.75 = Very Low, 1.76–2.50 = Low, 2.51–3.25 = High, and 3.26–4.00 = Very High.

For inferential statistics, the Wilcoxon signed-rank test was employed to evaluate whether there was a statistically significant difference between students' scores on the pretest and posttest following the application of the Digital Storytelling Approach. This non-parametric test was selected because the data did not meet the assumption of normality. A significance threshold of 0.05 was set for this analysis. All data were gathered and analyzed using Microsoft Excel for descriptive statistics, while inferential analyses and hypothesis testing were performed with the Statistical Package for the Social Sciences (SPSS).

Ethical Considerations

The study rigorously followed ethical research standards to safeguard the rights, dignity, and welfare of all participants. Before commencing the study, the researcher obtained formal approval from the Office of the School Principal at Diplahan National High School (Appendix A). The entire research process adhered to the guidelines outlined in DepEd Order No. 16, s. 2017 (*Research Management Guidelines*), which highlight voluntary participation, transparency, accountability, and respect for human dignity in all educational research activities within the Department of Education (Department of Education, 2017).

In accordance with the Data Privacy Act of 2012 (Republic Act No. 10173), stringent measures were implemented to safeguard the confidentiality of all information gathered (Republic of the Philippines, 2012). Data collected from participants were utilized exclusively for research purposes, and no personally identifiable information was included in any reports, presentations, or publications. Both physical and digital copies of the data were securely stored and made accessible solely to the researcher.

Before participation, all respondents received comprehensive information regarding the study's aims, procedures, potential benefits, and the voluntary nature of their involvement. They were informed about their rights as participants, including the ability to withdraw from the study at any time without any penalty or adverse consequences. Informed consent forms were provided, signed, and collected prior to the initiation of data collection.

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To reduce any potential bias or coercion, the researcher emphasized that a participant's decision to take part or not would not influence students' grades, academic standing, or treatment by teachers. The conduct of all research activities was carried out during regular class hours with approval and supervision from the school administration to ensure minimal disruption to instruction.

Furthermore, the researcher observed the ethical use of instructional materials. The digital storytelling material titled *"Liza's Overtime Challenge"* was adapted and contextualized from the DepEd General Mathematics Module, Unit 3: Wages, Overtime, and Commission. The modifications were limited to contextual adjustments that reflected the real-life experiences of Shielded Metal Arc Welding (SMAW) students while retaining the original learning competencies and educational intent. Proper citation and acknowledgment of DepEd as the source were observed to uphold intellectual property rights and academic integrity.

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RESULTS AND DISCUSSION

This section presents and analyzes the outcomes of implementing the Digital Storytelling Approach to improve the learning capabilities of Grade 11 students specializing in Shielded Metal Arc Welding (SMAW) within General Mathematics at a school in the Diplahan District. The analysis aimed to evaluate the effectiveness of digital storytelling by comparing the results of the pretest and posttest, as well as by assessing whether any differences were statistically significant.

All gathered data were organized, analyzed, and interpreted through both descriptive and inferential statistical methods. The Mean Percentage Scores (MPS) were evaluated according to DepEd Order No. 8, s. 2016, while the Wilcoxon signed-rank test was employed to assess the significance of the improvement observed between the pretest and posttest scores.

The Level of Academic Achievement Before the Intervention

Action Research Question 1. What is the mean score or academic achievement of Grade 11 SMAW students in mathematics before the conduct of digital storytelling?

Table 3. Level of Academic Achievement for the Pretest

Assessment	N	Mean	Standard Deviation	MPS
Pretest	37	6.00	5.00	50%

**Source: DepEd Order No. 8, s. 2016 (Outstanding, 90–100; Very Satisfactory, 85–89; Satisfactory, 80–84; Fairly Satisfactory, 75–79; and Did Not Meet Expectations, below 75).*

The pretest results reveal a mean score of 6.00, a mean percentage score (MPS) of 50%, and a standard deviation of 5.00. These results indicate that most students scored below the expected proficiency level before the implementation of the digital storytelling intervention. The low mean reflects limited prior knowledge and insufficient understanding of the mathematical concepts assessed, while the standard deviation suggests moderate variability in students' performance.

This finding confirms that learners entered the study with uneven foundational knowledge in mathematics, a pattern often observed among Technical-Vocational-Livelihood (TVL) students who struggle to connect abstract mathematical principles with practical, work-related contexts. Villanueva and Bernardo (2020) noted that technical-vocational learners frequently demonstrate lower initial performance in mathematics due to minimal exposure to contextualized instruction, and they recommend incorporating real-life applications and technology-enhanced approaches to improve engagement and comprehension.

Similarly, Hassan et al. (2019) emphasized that pretest data serve as diagnostic tools for identifying learning gaps and guiding instructional design. The low pretest results in this study highlight the need for contextualized and learner-centered strategies, such as the Digital Storytelling Approach, to bridge conceptual gaps and strengthen mathematical understanding.

In summary, the pretest findings portray a class with limited readiness and diverse ability levels, underscoring the importance of adopting innovative pedagogical methods that foster engagement, contextual understanding, and mathematical confidence among learners.

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The Level of Academic Achievement After the Intervention

Action Research Question 2. What is the mean score or academic achievement of Grade 11 SMAW students in mathematics after the implementation of digital storytelling?

Table 4. Level of Academic Achievement in the Posttest

Assessment	N	Mean	Standard Deviation	MPS
Posttest	37	14.30	0.845	95%

**Source: DepEd Order No. 8, s. 2016 (Outstanding, 90–100; Very Satisfactory, 85–89; Satisfactory, 80–84; Fairly Satisfactory, 75–79; and Did Not Meet Expectations, below 75).*

After the intervention, the posttest results revealed a mean score of 14.30, a mean percentage score (MPS) of 95%, and a standard deviation of 0.845. This indicates a substantial improvement in academic achievement compared with the pretest mean of 6.00, along with a notable reduction in score variability. The higher mean signifies enhanced mastery of mathematical concepts, while the lower standard deviation suggests more consistent learning outcomes among students.

The results demonstrate the effectiveness of the Digital Storytelling Approach in enhancing students' understanding and performance in mathematics. The use of narrative-driven and multimedia-integrated lessons helped learners visualize mathematical ideas within realistic, relatable scenarios, thereby improving both comprehension and motivation.

These findings are consistent with evidence that interactive and learner-centered instructional models significantly improve conceptual understanding and long-term retention (Sari et al., 2019). Similarly, Mendoza and Corpuz (2020) reported that contextualized and technology-based instruction leads to higher achievement among TVL students by making mathematics more relevant to real-world work environments. Furthermore, the relatively uniform posttest performance observed in this study aligns with the assertion that a decrease in score variability reflects effective instruction that accommodates diverse learner needs (Ormrod, 2016).

Overall, the posttest findings confirm that digital storytelling not only improved students' mathematical competence but also promoted equitable learning outcomes, benefiting all learners regardless of their initial proficiency levels.

Significant Difference of the Students' Academic Achievement in the Pretest and Posttest

Action Research Question 3. Is there a significant difference in the mean scores or academic achievement of Grade 11 SMAW students in mathematics before and after the conduct of digital storytelling?

Table 5. Test of Significant Difference of the Students' Academic Achievement in the Pretest and Posttest

Parameters	Findings
N	37
Probability	0.041
Wilcoxon	0.00
Decision on the Hypothesis	Reject Ho
Interpretation	*Significant*

**Note. The statistic used was the Wilcoxon signed-rank test, since the researcher utilized total enumeration.*

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The Wilcoxon signed-rank test was employed to assess the statistical significance of the improvement in students' academic performance. This non-parametric method was suitable because the data did not satisfy the normality assumption. A p-value of 0.041, which is below the 0.05 significance threshold, resulted in the rejection of the null hypothesis (H0).

This outcome demonstrates that the Digital Storytelling Approach had a notable positive impact on students' performance in General Mathematics. The mean score on the posttest was significantly higher than that on the pretest, suggesting that students were able to grasp and remember mathematical concepts more efficiently following the intervention.

These findings support Hakimah (2023), who reported that student-centered, interactive learning models such as Project-Based Learning (PBL) result in substantial posttest gains due to their ability to engage students in meaningful, contextualized experiences. Similarly, Sari et al. (2019) found that constructivist-based and technology-supported strategies foster deeper learning by allowing students to explore, collaborate, and apply concepts in authentic contexts.

Furthermore, Mendoza and Corpuz (2020) emphasized that technology-enhanced and contextually grounded instruction bridges the gap between theory and practice for TVL learners. The findings of this research confirm that digital storytelling acts as an effective tool for facilitating this integration, transforming abstract mathematical concepts into engaging, narrative-driven learning experiences that enhance comprehension and memory retention.

CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

This study aimed to determine the effectiveness of the Digital Storytelling Approach in enhancing the academic achievement of Grade 11 Shielded Metal Arc Welding (SMAW) students in General Mathematics at one school in the Diplahan District during School Year 2024–2025. Specifically, it sought to compare students' pretest and posttest performances and to evaluate the overall impact of the innovation on learning outcomes.

The findings revealed that, prior to the implementation of the Digital Storytelling Approach, students exhibited low academic performance, as reflected by a mean pretest score of 6.00 (SD = 2.095). After the intervention, the mean posttest score increased to 14.30 (SD = 0.845), indicating a remarkable improvement in students' achievement. The Wilcoxon signed-rank test ($p = 0.041$) indicated a statistically significant difference between the pretest and posttest scores, resulting in the rejection of the null hypothesis (Ho).

Conclusions

The results confirm that the Digital Storytelling Approach significantly improved students' mathematical performance. The improvement in posttest performance demonstrates that Digital Storytelling effectively addressed students' difficulties in engagement, comprehension, and conceptual application. By integrating visuals, narratives, and real-life contexts, students were able to relate abstract mathematical concepts to practical situations, resulting in deeper understanding, increased motivation, and greater confidence in mathematics learning.

The results support Constructivist Learning Theory (Bruner, 1961), which posits that learners construct knowledge through meaningful, discovery-based experiences, and the Cognitive Theory of Multimedia Learning (Mayer, 2005), which emphasizes that learning is enhanced when information is presented through both visual and verbal modalities. Together, these theories explain how Digital Storytelling fosters meaningful learning by combining multimedia elements with contextualized narratives to reinforce conceptual understanding and retention.

In summary, the Digital Storytelling Approach has proven to be a successful, creative, and student-focused teaching method that enhances mathematics achievement among Grade 11 SMAW students. Beyond raising

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www.jasdg.com
Volume 1 Issue 4 Pages 4217-4233
ISSN: 3155-7546 (Online)
DOI: 10.5281/zenodo.24294992

academic achievement, the approach also promoted digital literacy, creativity, communication, and collaboration, which are key competencies of 21st-century learners. This innovation contributes to the growing body of research advocating contextualized, technology-enhanced, and narrative-based teaching in mathematics education. The study provides empirical evidence supporting the use of Digital Storytelling as an effective pedagogical tool in mathematics education. It adds to the existing body of literature on contextualized and technology-integrated instruction, particularly in the TVL track, where mathematics is often perceived as abstract or irrelevant.

The research is consistent with Republic Act No. 10533, known as the Enhanced Basic Education Act of 2013, and DepEd Order No. 42, s. 2016, both of which emphasize contextualized and learner-centered instruction. Findings from this study can inform school-based innovation policies and Division-level Learning Recovery Programs, promoting evidence-based instructional strategies for numeracy development. The innovation provides a replicable instructional model that teachers can adopt or adapt to other mathematics topics or subjects. It demonstrates that technology integration, when grounded in storytelling and context, can make complex concepts more accessible and meaningful to students.

Recommendations

Based on the significant improvement in students' posttest performance following the implementation of the Digital Storytelling Approach, the following recommendations are proposed to ensure sustainability, scalability, and institutional support for this innovation:

1. **Teachers.** Teachers are encouraged to integrate Digital Storytelling in their mathematics instruction to foster engagement, comprehension, and real-world application of mathematical concepts. They should participate in training, workshops, or Learning Action Cell (LAC) sessions on digital content creation, multimedia integration, and story-based pedagogy. Teachers should also contextualize their digital stories using local or vocationally relevant examples to make learning more meaningful for students in different strands.
2. **School Administrators.** School administrators should provide technical and logistical support, such as access to ICT tools, multimedia equipment, and reliable internet connectivity. They should also promote peer sharing of best practices through LAC sessions and include digital storytelling as part of school-based innovation and instructional supervision programs. Institutionalizing this approach within school improvement plans can ensure its sustainability and alignment with the MATATAG Curriculum Framework.
3. **Curriculum Developers and Policy Makers.** Curriculum developers are encouraged to embed story-based, contextualized, and multimedia-enhanced activities in General Mathematics modules and exemplars. These materials should align with the Most Essential Learning Competencies (MELCs) and support the development of 21st-century skills such as creativity, critical thinking, and problem-solving. Policy makers may also consider advocating digital storytelling within national programs aimed at enhancing digital literacy and fostering innovation in education.
4. **Future Researchers.** Future studies may explore the long-term effects of the Digital Storytelling Approach across different grade levels and subject areas. Researchers may also investigate its impact on higher-level cognitive skills, innovation, and problem-solving capacity. Conducting similar studies using larger samples or true experimental and mixed-method designs can provide more robust validation and broader generalizability of findings.

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ACTION PLAN

The following table outlines the research project schedule and timelines related to the phases before, during, and after the execution of this action research.

Table 6. Action Plan of the Research Project

No.	Tasks	2025				
		Month 1	Month 2	Month 3	Month 4	Month 5
1	Write the Action Research proposal following the Division's format and suggestions	February				
2	Prepare pretest items and administer the pretest		July			
3	Provide intervention to the class		July			
4	Administer post-test		July			
5	Analyze pretest and post-test data		July			
6	Write results of the Action Research			August		
7	Completion of research output			August		
8	The final revision of the output & accomplishment of SET-CAR				September	
9	Accomplishment of Progress Report or Monitoring					September
10	Submission to the Research Committee					September

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FINANCIAL REPORT

The table below shows the cost estimates that were to be expended before, during, and after the conduct of this action research.

Table 7. Financial Report of the Research Project

No.	Activities	Items	Estimated Cost	Source of Fund
1	Supplies and Materials	1 ream bond paper A4 size Printer Ink 1 Black 1 Cyan 1 Magenta 1 Yellow	P 250 300 300 300 300	BERF
2	Reproduction	Labor and Materials	450	BERF
3	Foods	30 pax	1500	BERF
Total			**P 3,400**	

ACKNOWLEDGMENT

The researcher extends her heartfelt gratitude and appreciation to the following individuals whose support and contributions made this action research possible:

Dr. Virgilio P. Batan Jr., CESO V, Schools Division Superintendent, for approving the research proposal.

Ma'am Glorife C. Clavero, Planning and Research Section Head, for her unwavering support, valuable insights, and constant encouragement throughout the conduct and endorsement of this action research.

Sir Jonel B. Ferrer, School Head of Diplahan National High School, for granting permission to conduct the study and for his inspiring words that greatly motivated the researcher to accomplish this work.

Sir Peter Jr. Batan, SURI Adviser, for his invaluable guidance, constructive feedback, and continuous encouragement throughout the research process. His expertise, patience, and commitment significantly contributed to the study's completion and improvement. Thank you, Sir Peter, for being a truly exceptional mentor and source of inspiration.

The Basic Education Research Fund (BERF), for providing the financial assistance that ensured the successful implementation of this action research.

Mr. Reymar Z. Verbo, the researcher's husband, for his unconditional love, support, understanding, and prayers that continually inspired her to pursue her goals with perseverance and passion.

Her children, Princess, Junior, and Raphael, for being the source of her joy and inspiration, motivating her to persistently move forward in achieving her dreams.

Almighty God, for His divine guidance, wisdom, and blessings; her deepest gratitude for making all of this possible.

Finally, the researcher sincerely thanks all the people who have shown care and support.

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