The Effects of Animated Video Clips on Learners' Mathematics Proficiency
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The Effects of Animated Video Clips on Learners' Mathematics Proficiency

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Abstract

This quasi-experimental research was conducted to assess the efficacy of animated video clips as RMA-based intervention activities in enhancing Filipino learners' mastery of essential numeracy competencies, in alignment with the Department of Education's objectives. Specifically, it aimed to assess the mathematical proficiency of third-grade students in District I in one Division in Southern Negros. The researcher employed the researcher tool to evaluate the least acquired skills of the learners. The researcher created animated video snippets that were vetted and critiqued by professionals. The proponent used a verified, reliable 30-item pretest-posttest to assess learners' proficiency in mathematics. The quantitative data analysis was conducted using the mean, paired t-test, and independent t-test. A substantial disparity existed in the statistically significant positive relationship between the implementation of school-based interventions and pupils' mathematical proficiency. The enhancement in learners' mathematical competence can be attributed to the use of animated video clips, which serve as an efficient means of improving their skills. The researcher emphatically advised educators to consistently assess students' mathematical proficiency and to establish a reward system for those who attain the highest levels of proficiency after each mathematics remediation program. Parents should encourage their children to seek tutoring, particularly in mathematics. The school ought to designate a portion of its budget for programs, events, and activities explicitly associated with mathematics, and to incorporate the acquisition of books and materials essential for numeracy rehabilitation.

Keywords: *Animated video clips, learner achievement, mathematics proficiency*

Bio-Profile:

Jonel B. Delicana is a licensed public elementary school teacher under the Schools Division of Himamaylan City. He is currently assigned to Cantupa Integrated School, where he actively delivers quality instruction and fosters a positive learning environment for young learners. He holds a Master of Arts in Education major in Administration and Supervision, which has strengthened his competencies in educational leadership, school management, and instructional supervision. Research, titled "The Effect of Animated Video Clips on Learners' Mathematics Proficiency," reflects his strong interest in integrating technology into teaching to improve learners' academic performance, particularly in mathematics. His study examines how multimedia-based instructional materials can enhance learners' engagement, understanding, and achievement. His professional interests include innovative teaching strategies, learner-centered instruction, teacher effectiveness, and school improvement. He is particularly interested in exploring how educational technologies, professional development, and leadership practices contribute to better learning outcomes and holistic student development. Through continuous professional growth, classroom experience, and academic research, he aspires to contribute meaningfully to advancing educational practices and to the professional development of fellow educators.

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Introduction

Rationale

Teaching and learning mathematics can be made more pleasurable and rewarding by using instructional tools—The Effect of animated video clips on learners' mathematics proficiency: Conveying ideas and engaging students. Today's effective math teachers can use animated video clip techniques as instructional materials. When teaching arithmetic, math teachers consider using learning tools and interventions based on the Rapid Mathematics Assessment. Teachers can overcome this difficulty by using technology-based programs grounded in research on how kids learn subjects and validated by science (Clements & Wright, 2022).

Out of the 79 participating economies, the Philippines placed second-to-last in science and math when it first participated in PISA in 2018. Most Filipino students still need proficiency in one of the three PISA subjects due to the country's wide socio-economic gap. Some pupils even had trouble comprehending and using mathematical ideas, formulas, and procedures (Domondon, Pardo, and Rin, 2022). Agup & Agup (2020) emphasized that mathematics is typically viewed as complex and demanding.

The process of teaching and learning mathematics can become more enjoyable and fulfilling by using instructional tools (Almuslamani et al., 2020). The significant challenges in numeracy skills among learners who consistently rank low in international assessments like PISA 2022 (Borromeo et al., 2020). Specifically, only 16% of Filipino students reach the minimum proficiency level in mathematics, well below the OECD average of 69%. Furthermore, almost no students achieve the highest levels of proficiency in mathematics. The numeracy result in our cluster, of which 35% belonged to non-numerates, during the pre-test.

In line with this, the researcher developed school-based intervention programs to enhance learners' proficiency in Mathematics. Guided by the competencies identified in the MATATAG curriculum, the researcher created animated video clips as engaging tools to reinforce key mathematical concepts and provide students with an interactive, visually stimulating learning experience. Educators can efficiently address challenges in Math among learners by using animated video clips informed by research on how students learn and scientifically validated (Clements et al., 2022). This study developed a video-based bargaining mechanism and assessed its impact on learners' learning, focusing on their behavior and mathematical competency during the learning process, using animated video clips.

Literature Review

Learners' mathematics proficiency is shaped by their cognitive and emotional responses to the subject, with students often perceiving mathematics as either engaging or intimidating (Elliott, 2023). Among poorly performing Filipino students, difficulties are linked to cognitive and metacognitive behaviors (Lapinid et al., 2022), which are influenced by cognitive appraisal—the process of evaluating and interpreting tasks that determines emotional and behavioral reactions (Litwic-Kaminska, 2020). In mathematics, this appraisal affects attitudes, motivation, and achievement (Forsblom et al., 2022), particularly through perceived task difficulty, which depends on prior knowledge, problem-solving skills, and self-efficacy (Karin et al., 2022; Kaskens et al., 2020; Sian Hoon et al., 2020). Students who view tasks as overly difficult may experience anxiety and disengagement (Kaskens et al., 2020). Additionally, attribution of success or failure—whether internal or external, stable or unstable—shapes future performance and motivation (Suter et al., 2022; Main, 2023). Self-efficacy, or belief in one's ability to succeed, strongly influences persistence and confidence in mathematics (Wilde & Hsu, 2019; Zakariya, 2022) and is developed through experiences, feedback, and social comparison (Hayat et al., 2020; Cherry, 2023). Attitudes toward mathematics, explained by expectancy-value theory, are guided by beliefs about competence and the value placed on the subject (Zheng et al., 2017; Dewi, 2018), and positive attitudes are consistently associated with higher academic achievement, active engagement, and recognition of mathematics' real-life and career relevance (Wakhata et al., 2022; Peteros et al., 2022; Hwang & Son, 2021).

Mathematical proficiency reflects a constructive mindset characterized by self-confidence, persistence, adaptability, and eagerness to learn, enabling students to persevere through challenges and view difficulties as

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opportunities for growth rather than sources of anxiety (Ishak et al., 2020). Often described as the opposite of mathematics anxiety, it involves risk-taking, help-seeking, and the development of effective problem-solving strategies, all of which are associated with positive attitudes and higher academic achievement (Xenofontos & Mouroutsou, 2022). Proficiency can be cultivated through supportive learning cultures in both formal and informal settings, particularly for students who have previously experienced stress or failure in mathematics (Johnston-Wilder et al., 2019). It is also reflected in learners' adaptability and willingness to try new approaches when facing setbacks (Hutauruk & Priatna, 2017). Research conceptualizes mathematical resilience either as high achievement despite disadvantage or as the capacity to persist through difficulty (Xenofontos & Mouroutsou, 2022), with evidence showing that highly resilient students employ effective strategies to overcome challenges, while those at moderate levels may struggle with complex tasks (Harsela et al., 2021; Hutauruk & Priatna, 2019). In the Philippine context, students demonstrate resilience alongside moderate anxiety, indicating sustained motivation despite uneasiness; however, resilience alone does not eliminate anxiety, highlighting the need for teachers to also foster creativity, self-determination, motivation, and sustained interest in mathematics (Casinillo et al., 2022).

Research indicates that students' attitudes toward Mathematics are multidimensional, primarily involving interest and anxiety, and that positive attitudes significantly predict better academic performance, with some studies showing that female students outperform male students (Panerio, 2019; Gholami, 2023). Self-concept in Mathematics is moderately developed among students and is positively related to achievement, though this relationship does not differ by gender, underscoring the value of Math performance enhancement programs (Peteros et al., 2019). Significant relationships have been found between attitude and anxiety (positive correlation) and between anxiety and performance (negative correlation), confirming that higher anxiety is linked to lower achievement (Casty et al., 2021). While students may generally demonstrate positive attitudes and moderate self-efficacy, their actual performance can remain only fair, suggesting that other factors within the learning environment are influencing their performance (De Vera et al., 2022). Demographic variables such as residence, school type, and parents' educational background also show significant associations with Math performance, whereas gender and family income may not consistently predict outcomes (Hathella & Priyanath, 2021). Although some studies report no gender-based differences in attitudes, declines in female students' attitudes at higher grade levels highlight the need to sustain positive perceptions (Simegn & Asfaw, 2017). Overall, mathematics anxiety remains a global concern negatively affecting performance, prompting the implementation of behavioral and skill-based interventions to improve students' problem-solving abilities and overall achievement (Shakmaeva, 2022).

Animated video clips, particularly those grounded in RMA-based interventions, are recognized as innovative 21st-century instructional tools that positively influence students' mathematics learning across cognitive and affective domains (Hii Bii Hui et al., 2022). Research from 2018–2022 indicates that game-based and video-supported learning enhances knowledge and mathematical skills while also improving achievement, attitude, motivation, interest, and engagement. Students' attitudes toward mathematics strongly predict performance (Adamu, 2020; Alibraheim, 2021), as learners who enjoy mathematics, value its relevance to academic and career success, and feel confident in their abilities tend to achieve more highly (Hwang & Son, 2021; Wakhata & Balimuttajjo, 2022). However, studies show that attitudes vary by mathematical content, with adults generally expressing more positive feelings toward whole numbers than fractions (Sidney et al., 2021), and global trends reveal a decline in positive attitudes, especially among secondary students (Wen & Dubé, 2022). Attitudes—defined as predispositions to respond favorably or unfavorably to a subject—are shaped by experiences and remain dynamic rather than fixed (Ndlovu, 2017). Curriculum design, instructional strategies, and meaningful learning experiences significantly shape these attitudes, which are closely linked to persistence, self-confidence, problem-solving ability, and overall academic success (Atanasova-Pachemska et al., 2019).

Students' success in Mathematics is widely linked to their attitudes, anxiety levels, and resilience, with positive attitudes fostering achievement and negative attitudes contributing to defeatist mindsets (Meece et al., 2020; Rosli & Alias, 2020; Alias, 2020). Research shows that interventions—such as animated video clips and targeted attitude-improvement programs—can effectively shift negative perceptions, enhance motivation, build confidence, and reduce anxiety, leading to improved mathematical performance (Reeves et al., 2017; Hong et al., 2020). Programs that strengthen students' belief in their mathematical abilities through achievable goals and constructive feedback further

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reinforce positive attitudes and outcomes (Wilson et al., 2021). Incorporating real-world applications of mathematics into instruction also increases students' appreciation of its relevance and value, promoting more favorable attitudes (Smith & Jones, 2020). Since math anxiety negatively affects engagement and performance, with higher anxiety associated with lower grades and lower anxiety linked to higher achievement (Samante & Alave, 2021; Tanujaya & Mumu, 2022), fostering confidence, reducing anxiety, and nurturing resilience are essential strategies for improving students' overall success in Mathematics.

Research highlights animated video clips and game-based learning as effective 21st-century strategies for improving students' attitudes toward Mathematics by integrating real-world applications, increasing engagement, and promoting student-centered, constructivist learning environments (Smith & Jones, 2019, 2020; Ahmad & Iksan, 2021; Zou, 2020; Lasut & Bawengan, 2020). Since students' success in mathematics is strongly influenced by attitude, anxiety, and resilience (Meece et al., 2020; Rosli & Alias, 2020), interventions delivered through video clips and gamified approaches help build confidence, reduce anxiety, and enhance motivation, thereby improving performance (Hong et al., 2020; Khairuddin & Mailok, 2021; Hernández-Lara & Serradell-López, 2020). Math anxiety—closely linked to lower achievement—can be mitigated through cognitive and emotional support interventions, particularly longer programs targeting older students (Samante & Alave, 2021; Tanujaya & Mumu, 2022; Sammallahti, 2023). Promoting a growth mindset, fostering supportive and collaborative classroom environments, and teaching effective problem-solving and coping strategies further strengthen mathematical resilience, which is associated with perseverance, confidence, and improved problem-solving ability (Limeri et al., 2020; Berlin & Cohen, 2020; Rohmah et al., 2020; Callaman, 2023; Dilla et al., 2018). Overall, resilience and positive attitudes are not fixed traits but can be cultivated through intentional instructional strategies, empowering students to overcome challenges and succeed in Mathematics.

Theoretical Underpinnings

The development of children's cognition can be linked to mental computations. Jean Piaget's Theory of Cognitive Development was introduced. The central claim of the theory is that the cognitive structures of the human mind are adaptations that increase the likelihood of survival by providing humans with the proper "fit" for the environment. According to this, human intelligence is an adaptation shaped by experience, enabling people to act appropriately in their surroundings and survive. The quick passage from the subjective structure of the problem to a quantitative or numerical description is why Piaget proposed that youngsters struggle to understand certain concepts.

According to Piaget, the use of dynamic techniques that can enable the child to investigate abruptly and require that "new realities" be discovered, rediscovered, or possibly reproduced by the student, who is not just advised to him (Piaget, 1968), are conditions that can aid the child in his quest for understanding. With this theory, students may develop better mental math skills if taught at an early age. Early instruction in quick calculations could significantly enhance students' success in later math courses. As a result, the study conducted an experiment in which students applied Piaget's Theory of Cognitive Development to solve lengthy arithmetic problems involving addition, subtraction, multiplication, and division using the Rapid Mental Arithmetic (RMA) method. The improvement in cognitive development in solving arithmetic problems using this strategy is evidence of the study's success.

To guarantee that students are ready for the twenty-first century, the Framework for 21st-Century Learning (P21) is necessary. The prevalence of digital media facilitates collaboration, information access, and the use of technology instruments. Several tools are necessary for mathematical learning to help students actively deepen their comprehension of the subject. When teaching mathematics, teachers carefully select appropriate resources (Santos, 2020).

Objectives

This study mainly focused on the effectiveness of animated video clips on Learners' Mathematics Proficiency in an integrated public elementary school in a far-flung area of a medium-sized division during SY 2025 - 2026. Specifically, the researcher sought to answer the following questions: 1) the Proficiency levels in Mathematics of the

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control and experimental groups in pre-test and post-test; 2) the significant difference in the Proficiency levels in Mathematics in the pre-test and posttest of the control group; 3) the significant difference in the Proficiency levels in Mathematics in the pre-test and post-test of the experimental group; 4) the significant difference in the Proficiency levels in Mathematics in the pre-tests of the control and experimental groups; and 5) the significant difference in the levels of Mathematics performance in the post-tests of the control and experimental groups.

Methodology

This section discusses the methods used to gather and analyze data based on the specific predetermined objectives. This outline includes research design, subject-respondents, research instruments, data collection procedures, ethical considerations, data analysis, and statistical methods.

Research Design

This study was conducted to determine the effect of Animated video clips as a school-based intervention program in improving learners' proficiency in Mathematics. The researcher in this study utilized a quasi-experimental quantitative research design. Quasi-experimental research is a research method that attempts to establish a cause-and-effect relationship between an independent and a dependent variable. Still, it lacks random assignment of participants to treatment or control groups (Capili, 2024). It is used when an actual experiment is not feasible for practical or ethical reasons, making it an intermediate method between an actual experiment and a purely observational study. Instead of random assignments, groups are often pre-existing, or selection is based on self-selection or researcher judgment.

Respondents

There are two Grade 3 sections at one of the elementary schools in Southern Negros, with a total of 44 learners. The respondents of the study were purposively selected, comprising a total of forty-four (44) Grade 3 learners during the School Year 2025-2026 who received the remark "non-proficient" during the pre-test. There were 22 students in each group. All respondents completed the questionnaires provided by the researcher.

Instrument

The study utilized a researcher-developed 30-item objective test, adapted from previous unified Mathematics 3 examinations, administered as both a pre-test to determine group equivalence and prior knowledge and as a post-test to measure learners' mathematics performance. To ensure validity—defined as the extent to which an instrument accurately measures its intended construct (Dudovskiy, 2019)—the self-made instrument underwent face validation by three field experts who evaluated its content relevance and clarity using criteria by Carter V. Good and Douglas E. Scates; their feedback was incorporated, resulting in a validation score of 4.74 ("Excellent"), confirming the tool's appropriateness for data gathering. Reliability was established through a pilot test with 30 Grade 3 students sharing similar characteristics with the target respondents, and the Students' Learning Motivation section yielded a Cronbach's alpha of .869, indicating good internal consistency and confirming the instrument as a reliable measure of students' learning motivation and engagement.

Procedure for Data Collection

Prior to data collection, the researcher secured formal approval from the Schools Division Superintendent of the Department of Education to conduct the study in a selected public elementary school. Coordination with school heads and Grade 3 advisers followed to arrange the schedule and explain the study's purpose. Ethical standards were strictly observed through the distribution of child-friendly assent forms, ensuring voluntary participation, confidentiality, and the right to withdraw at any time. Only pupils who signed the assent forms were included. The researcher also administered a standardized assessment to determine learners' least mastered skills, which served as the basis for developing the intervention materials.

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The development of the animated video clips was grounded in a careful review of learners' diagnostic, pre-test, and quarterly exam results, as well as the Most Essential Learning Competencies (MELCs) for Grade 3 Mathematics in the fourth quarter using the RMA Assessment tool. Three identified competencies guided the creation of instructional materials. The researcher ensured alignment with lesson objectives and adhered to DepEd LRMS guidelines for non-print materials, considering instructional and technical quality. The video clips incorporated background information, animations, examples, exercises, and interactive elements to enhance engagement. Applications such as AniMaker and KineMaster were used to produce the materials, integrating animations, sound effects, and visual enhancements. The finished video clips underwent expert validation, including IT review, and revisions were made based on feedback and field testing.

The study followed three phases: pre-test, experimental, and post-test. A revised 30-item test (from an initial 35 items) was administered as a pre-test to assess learners' mathematical proficiency, with the researcher personally overseeing distribution and scoring. During the eight-week experimental phase, 44 pupils were divided into two groups: 22 were exposed to RMA-based animated video clips, while 22 received printed modules and traditional instruction. The Rapid Mathematics Assessment included oral pre- and post-assessments to monitor growth. At the end of the intervention, the same test was administered as a post-test, and the results were analyzed using mean scores to determine the effectiveness of the animated video clips in enhancing learners' mathematics proficiency.

Data Analysis and Statistical Treatment

Objective 1 used descriptive-analytical methods and mean to determine the proficiency levels in Mathematics of the control and experimental groups on the Pre-test and Post-test. Objective 2 used a comparative analysis and paired t-tests to determine a significant difference in the control group's proficiency level in Mathematics between the pre-test and post-test. Objective 3 used a comparative analysis and paired t-tests to identify a significant difference in the experimental group's proficiency level in Mathematics between the pre-test and post-test. Objective 4 used a comparative analysis and an independent t-test to identify a significant difference in Mathematics proficiency between the pre-tests of the control and experimental groups. Finally, objective 5 used a comparative analysis and an independent t-test to identify a significant difference in Mathematics proficiency between the post-test scores of the control and experimental groups.

Ethical Considerations

This study adhered to established ethical standards in educational research to ensure the integrity of the research process and the protection of all participants. Prior to data collection, informed consent was obtained from all respondents, including teachers, school heads, and other personnel involved. Consent forms outlined the voluntary nature of participation and clarified that no incentives or coercive measures were used. Confidentiality and anonymity were strictly maintained throughout the study. Data were stored securely and accessed only by the researcher for academic purposes. Findings were reported in aggregate form to avoid disclosing any sensitive or identifiable information. The participants secured informed consent and parents' permission to participate. They received sufficient information and assurances about participating to enable them to understand the effects of their engagement and make an adequately informed, freely given decision that their participation is voluntary, free from any coercion, persuasion, or whatsoever.

Results and Discussions

This section summarizes the study's findings, which come from careful data gathering, in-depth analysis, and thoughtful interpretation. After this, meaningful conclusions were drawn from the initial phase, offering valuable insights.

Proficiency Level in Mathematics of the Control and Experimental Group in the Pre-test and Post-test

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Table 1
Descriptive Analysis on the Proficiency level in Mathematics of the control and experimental groups in the pre-test and post-test

Group	N	Pretest Mean	Interpretation	Posttest Mean	Interpretation
Control Group	22	6.53	Low proficient	14.47	Nearly Proficient
Experimental Group	22	6.53	Low proficient	21.56	Proficient

As shown in Table 1, the learners in the control group had a mean pre-test score of 6.53, indicating a low level of proficiency in mathematics. The above data showed that students from both groups had almost the same prior knowledge in mathematics 3, on which they were tested. Low performance in mathematics is a multifaceted issue influenced by pupil-level factors, such as attitudes and foundational skill gaps; teacher- and school-level factors, such as instructional quality and class size; and socio-economic factors, such as parental occupation and home support. To address this, interventions need to be comprehensive, combining improved instructional strategies and interventions, targeted support for struggling students, enhanced parental involvement, and a focus on fostering a positive attitude toward Mathematics.

After the test, many students commented that the questions were difficult. As a key stage 1 teacher for 5 years, the researcher is not surprised by the test results.

Table 1 indicates that the Control Group had an increase in the overall posttest mean score of 14.47, categorized as Nearly Proficient, indicating improvement in learners' achievement in this group. However, after the experimental group was exposed to school-based intervention activities such as animated video clips, their level of mathematics performance improved. The posttest score rose to a mean of 21.56, interpreted as proficient. This was further confirmed by the means of learners who passed the posttest.

This was further confirmed by the means of students who passed the posttest. Grade 3 learners showed representation in the Proficient category. These results suggest improvements in learners' proficiency levels. Addressing these gaps requires a focus on continuous assessment and tailored instructional strategies to support learners who struggle with core mathematical concepts. The study concludes that mathematical proficiency among Grade 3 learners improved, with most students categorized as highly proficient. The findings reveal that significant gaps in foundational skills were addressed, leading to increased proficiency among pupils. These results highlight the importance of early and continuous interventions to strengthen learners' mathematical abilities, which are needed to implement differentiated instructional strategies that effectively address diverse learner needs. Enhancing early-grade mathematics education is vital to ensuring learners are prepared for more advanced concepts.

Based on the results, it is recommended that schools implement targeted remedial programs focused on foundational numeracy skills. Teachers should receive professional development to employ evidence-based strategies in school-based interventions and to adapt instruction to meet learners' needs. Additionally, incorporating interactive and engaging mathematics activities can help address proficiency gaps and motivate learners. Policymakers should consider allocating resources to support early-grade mathematics programs and ensure the availability of learning materials. Lastly, regular monitoring and assessment should be conducted to track learners' progress and refine school-based interventions as necessary.

The literature emphasized the role of teacher training and adaptive learning materials in addressing these challenges (Marienko et al., 2020; Moore et al., 2021). Ensuring that instructional strategies are responsive to learners' needs is crucial for preventing further declines and building a strong foundation in mathematics. Additionally, collaboration among teachers, parents, and other stakeholders is vital to creating a supportive learning environment.

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Comparative Analysis on the Proficiency Level in Mathematics of the Control and Experimental Groups in the Pre-test and Post-test

Table 2
Significant difference in the Proficiency level in Mathematics in the pre-test and post-test of the control group

Test	Mean	Degree of Freedom	t-value	Significant Level	p-value	Interpretation
Pretest Posttest	6.53 14.47	21	6.834	0.05	0.023	Significant

Table 2 showed a significant difference in participants' proficiency level in Mathematics, as indicated by the posttest mean score. The findings showed that there is a significant difference in the mean score between the control group, with a t-value of 6.834 and a corresponding p-value of 0.023. Thus, the control group in particular shows improvement in mathematics performance when using the modules. This implied that the post-test score of the control group was significantly different from the pre-test score. Thus, rejecting the null hypothesis.

This implied that using self-learning modules and a traditional approach increased the pupils' mathematics performance in the control group. Modules can be practical for mathematics performance, particularly when well-designed and well-supported, but effectiveness depends on factors such as module quality, teacher guidance, and student support. While modules can foster independent learning and may be positively associated with performance, they also pose challenges, such as difficulties with problem-solving and a need for support from parents or teachers (Malgapo, 2024). Modules can help improve mathematical understanding and lead to better performance, particularly when guided by teachers or para-teachers (Benito, 2024).

Table 3
Significant difference in the Proficiency level in Mathematics in the pre-test and post-test of the experimental group

Test	Mean	Degree of Freedom	t-value	Significant Level	p-value	Interpretation
Pretest Posttest	6.53 21.56	21	14.243	0.05	0.000	Significant

A Paired Samples T-test comparative analysis revealed a strong, statistically significant between the pre-test and post-test of the experimental group implementation of animated video clips as a school-based intervention in improving the mathematics proficiency level of pupils, t = 14.243, p=.000. The significant result (p = .000) led to rejection of the null hypothesis, indicating these variables are substantially related in this population. These findings demonstrate that pupils who got higher mathematical scores tend to show correspondingly stronger participation and interest in the implementation of animated Video clips as a school-based intervention activity.

Results indicate a statistically significant difference between the pre-test and post-test of the experimental group in the implementation of animated video clips as a school-based Intervention and the Mathematics proficiency level among pupils. This means that when pupils achieve higher levels of mathematics proficiency, they also tend to participate more in the intervention. Conversely, lower levels of Mathematical Proficiency are associated with lower participation in the intervention. Results consistently show that these two constructions are positively correlated, meaning they tend to move in the same direction. When one increases, the other tends to increase as well. This suggests that higher Mathematical Proficiency is associated with greater participation in the intervention, and vice versa. This can be achieved through various means, such as providing growth opportunities, fostering a positive work environment, and recognizing and rewarding pupils' participation (Phipps, 2023).

Instructional video is a type of multimedia instruction in which graphics are in the form of motion pictures recorded by a camera, and words are in the form of speech and background sounds recorded by a microphone (Mayer

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et al., 2020). Richard Mayer's seminal book Multimedia Learning details his extensive research on how to structure multimedia materials effectively to maximize learning. According to Mayer (2020), when multiple pieces of information are on-screen, learners need to know what to pay attention to, where they are in the presentation, and how to integrate the information to construct their mental models. Accordingly, the signaling principle recommends that instructors add cues that direct learners' attention to salient material. Mayer is careful to point out that this can be overdone, so presenters should use signals sparingly. Use arrows, highlighting, and other signals to draw attention to important information.

According to Hii Bii Hui et al. (2022), RMA-based interventions, such as video clips, are among the modern trends in education in the 21st century. Numerous studies have examined the influence of teaching on students' academic attainment. It is crucial to integrate the cognitive and affective domains into teaching and learning strategies. This study aims to review journal articles published from 2018 to 2022 on the influence of video clips in mathematics T&L on students' cognitive and affective domains. The study results showed that video clips have positively impacted students' learning of mathematics. It is comprised of two types of cognitive domain that include knowledge and mathematical skills, and five types of affective domain: achievement, attitude, motivation, interest, and engagement.

Video clips in education are now among the major learning trends of the 21st century (Ahmad & Iksan, 2021), and they have received increasing academic attention in recent years (Zou, 2020). GBL is a mathematics teaching technique that balances classroom learning and educational games while enhancing learning efficiency through student-centered activities (Lasut & Bawengan, 2020). It is also one of the more creative and entertaining methods, and, indirectly, students will pay attention to the teacher's lessons. This is because playing games is innate to the students. Additionally, educational games may encourage students to enjoy learning, feel comfortable approaching a variety of difficulties along the way, and overcome these challenges with focus, self-assurance, and patience, all of which are crucial for higher education in developing lifelong learners (Liu et al., 2021).

Table 4
Significant Difference in the Proficiency level in Mathematics in the pre-tests of the control and experimental groups

Test	Mean	Degree of Freedom	t-value	Significant Level	p-value	Interpretation
Control Group	6.53	21	0.000	0.05	1.000	Not Significant
Experimental Group	6.53					

Table 4 showed a significant difference in learners' mathematics performance levels, as indicated by the pre-test mean score. The findings showed that there was no significant difference in the mean score between the experimental and control groups, with a t-value of 0.000 and a corresponding p-value of 1.00. Thus, there was sufficient evidence to conclude that both the control and experimental groups exhibited the same level of mathematics performance. This implied that the pre-test scores of the experimental groups were not significantly different from those of the control group. Thus, we accept the null hypothesis.

Recent reports, particularly the 2022 PISA results, indicate that Filipino students have low performance in mathematics, ranking sixth from the bottom among 81 participating countries with an average score of 355, significantly below the OECD average. These results show no significant improvement from 2018, with many learners failing to meet the minimum proficiency level needed for societal participation. Key challenges include mastery of foundational skills, particularly fractions, and the significant impact of socio-economic factors on performance. Teachers must actively incorporate practical strategies to improve learners' mathematics proficiency as an intervention to enhance engagement and understanding.

As a recommendation, the Rapid Mathematics Assessment (RMA), which uses video clips as an efficient and systematic approach to evaluating learners' fundamental mathematical skills, emphasizes core competencies such as number sense, basic operations, and simple problem-solving (Galatsopoulou et al., 2022). Numeracy skills among

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learners consistently rank low in international assessments such as PISA 2022 (Borromeo et al., 2020). Specifically, only 16% of Filipino students reach the minimum proficiency level in mathematics, well below the OECD average of 69%.

Table 5
Significant Difference in the Proficiency levels in Mathematics in the post-tests of the control and experimental groups

Test	Mean	Degree of Freedom	t-value	Significant Level	p-value	Interpretation
Control Group	14.47	21	9.650	0.05	0.000	Significant
Experimental Group	21.56					

Table 5 showed a significant difference in participants' mathematics proficiency levels, as indicated by the posttest mean score. The findings showed a significant difference in the mean score between the experimental and control groups, with a t-value of 9.650 and a corresponding p-value of 0.000. Thus, rejecting the null hypothesis. There was sufficient evidence to conclude that the experimental group, in particular, exhibits a higher level of academic performance than the control group. This implied that the post-test scores of the experimental group were significantly different from those of the control group.

The above data further showed that students from both groups had acquired additional knowledge in their Mathematical concepts after several lessons were introduced, including school-based activities, specifically animated video clips. Furthermore, the posttest showed that the control group's mean differs significantly from that of the experimental group. The findings showed that pupils exposed to animated video clips achieved higher scores than the control group using the module.

This result was supported by Lester (2021) in his study investigating the effects of mathematics on the achievement of grade 7 students. The results indicated that the experimental group's mean posttest score was significantly higher than the control group's. According to the same study, animated video clips offer intelligent capabilities to improve learning and teaching. In addition, Lester's study raised the issue of preparing qualified teachers to use new technologies and software effectively.

Another study by Almeqdadi (2022) on a sample of 52 students from the Model School, Yarmouk University, Jordan, investigated the effect of using animated video clips on learners' understanding of some mathematics concepts. Data showed a significant difference in the means of students on the posttest, with greater gain from pre-test to posttest in the experimental group. The students in the experimental group used animated video clips for 4 weeks, while the students in the control group used only the textbook. This result showed that students who used animated video clips performed significantly better than those who only used the traditional approach.

These findings demonstrate that pupils who got higher mathematical scores tend to show correspondingly stronger participation and interest in the implementation of animated Video clips as a school-based intervention activity. Results indicate a statistically significant improvement in the implementation of animated Video clips as a school-based Intervention for mathematics proficiency of pupils. This means that when pupils achieve higher levels of mathematical proficiency, they also tend to participate more in the intervention. This suggests that higher mathematical proficiency is associated with greater participation in the animated video clip school-based intervention. This can be achieved through various means, such as providing growth opportunities, fostering a positive work environment, and recognizing and rewarding pupils' participation (Phipps, 2023).

Galatsopoulou et al. (2022) revealed that students' positive attitudes towards videos and all factors were significantly related to the intention of use. In addition, the technical aspects of the video did not pose a problem in the educational process, most likely due to the contemporary quality of internet connections, audiovisual productions, and playback equipment. The duration of the videos was also not presented as an issue, as there are flexible ways to

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embed videos in the learning process. Overall, videos can be used in multiple active learning scenarios to enhance students' motivation and engagement and provide a joyful, collaborative, and hospitable learning environment. Students are familiar with digital tools and technologies and seem to enjoy audiovisual material in the learning process.

Moreover, Ali et al. (2020) found that students enjoyed watching educational videos and used them for academic purposes. They have many advantages from watching educational videos in and out of the classroom. As a result, most students believed their academic results improved after watching educational videos. The study by Pumbaya et al. (2020), on the other hand, revealed that learners taught with video clip enrichment in Mathematics achieved "very satisfactory" academic performance. This means that learners at this level have developed basic knowledge, skills, and key understandings, and can transfer them separately through genuine performance tasks. There is also a significant difference in the mean gain scores for academic performance between Grade 8 learners taught with video clip enrichment and those taught with K to 12 learning modules after the intervention; hence, the experimental group achieved significant growth in conceptual understanding, which could be attributed to the use of video clips. The experimental group gained positive experiences, becoming excited, attentive, and participative in class, which could have led to better academic performance in the subject. Therefore, the use of video clips in science lessons could enhance learners' academic performance.

Rakhmanina et al. (2020) also concluded that learning to speak through videoblogging is more effective than the expository strategy; students with high learning motivation have higher speaking ability than those with low motivation; and there is an interaction between teaching strategies and motivation in the teaching of speaking.

Conclusion

The findings revealed that both control and experimental groups initially demonstrated low proficiency in Mathematics based on pre-test results, with no significant difference between the groups. After the intervention, the control group showed improvement to a Nearly Proficient level, while the experimental group—exposed to animated video clips—achieved a Proficient level, with a large and statistically significant increase from pre-test to post-test. A significant difference was also found between the post-test scores of the two groups, indicating the stronger impact of the animated video clip intervention. The study concluded that the developed animated video clips were highly acceptable and positively received by learners, effectively enhancing engagement, understanding, and overall mathematics performance. These results affirm that quality-assured multimedia resources are effective instructional tools and that integrating animated video clips into Mathematics teaching can significantly improve learners' academic achievement and classroom learning experiences.

Recommendation

This study recommends strengthening educators' technical training and capacity development to enhance digital proficiency and effective academic applications, with support from the Division's IT Team for skills dissemination. Curriculum developers and policymakers are encouraged to integrate clear guidelines for multimedia use—particularly video clips—and to regularly update standards to align with evolving educational technologies that positively impact Mathematics learning. School administrators should provide ongoing professional development and allocate resources for high-quality multimedia materials and technological infrastructure. Teachers are urged to purposefully integrate well-aligned and quality-assured video clips into Mathematics instruction to boost engagement and understanding, while learners should actively participate in related discussions and activities to maximize learning. Future researchers are encouraged to examine the long-term effects of video clip integration on students' mathematical proficiency and attitudes.

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Authorship Contribution Statement

Delicana: Concept and design, literature review, data collection, analysis, interpretation, and editing. **Binaloga**: Reviewing, supervision, and material support.

Conflict of Interest

The authors declare no conflict of interest related to the conduct, authorship, and publication of this research. All procedures and interpretations were performed independently, and no financial, professional, or personal relationships influenced the results of this study.

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