Impact of animated video media on enhancing numeracy skills among primary school students

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Abstract

Background: The low level of student participation in the learning process is often attributed to the use of methods that fail to engage students' interest. This issue underscores the need for innovative approaches in teaching to enhance student engagement, one of which involves the utilization of animated video media, which has the potential to create more engaging learning experiences.

Aim: This study aims to explore and describe the impact of using animated video media as a learning tool on the numeracy skills of elementary school students.

Method: This research adopts a quantitative approach, where the data collected is numerical and analyzed using statistical methods. The study population consisted of 48 students from an elementary school in the Lalang area, Sungai Apit District. The sample comprised 31 students, divided into two classes, selected through random sampling techniques. Data collection was conducted through direct observation in collaboration with the classroom teacher. Data analysis involved normality tests, homogeneity tests, and an independent sample T-test.

Result: The findings of this study indicate an improvement in students' numeracy skills through the use of animated video media. This improvement is evident from the comparison of pretest and posttest scores, where the experimental class demonstrated an increase of 28.67 compared to the control class.

Conclusion: The use of animated videos positively impacts mathematics learning outcomes and contributes to enhancing the numeracy skills of elementary school students.

INTRODUCTION

Education plays a strategic role in developing the quality of human resources capable of competing in the global era. At the elementary school level, education serves as a critical foundation for fostering mathematical skills (Sulistiani & Masrukan, 2016). Mathematics is one of the primary subjects taught at this level (Acharya et al., 2021; Mainali, 2021). As a fundamental discipline, mathematics not only provides a basis for various scientific fields but also cultivates students' reasoning and problem-solving abilities (Wulandari et al., 2022). Therefore, high-quality mathematics education in elementary schools is essential. However, mathematics is often perceived by students as difficult and monotonous, which leads to low motivation and participation in the learning process (Emanuel et al., 2021; Mariamah et al., 2021; Tasdik & Amelia, 2021). This issue is frequently caused by teaching methods such as lectures and repetitive exercises that fail to engage students' interest (Widayat et al., 2024; Woods & Copur-Gencturk, 2024). This

lack of interest directly affects students' numeracy skills, which are among the key competencies in mathematics.

The era of globalization and technological advancement, numeracy skills have become one of the essential competencies that students must possess. These skills are not only relevant in mathematics education but also play a crucial role in enabling students to make informed decisions in various real-life contexts, such as managing time, budgeting, or interpreting graphs (Sa'adah et al., 2021; Yustitia & Siswono, 2021). Unfortunately, educational surveys reveal that Indonesian students' numeracy skills remain below international standards (Argina et al., 2017; Martin et al., 2012; Rahman, 2014). This situation highlights the urgent need for innovative approaches in teaching to enhance students' numeracy skills. The implementation of engaging and effective instructional media is expected to support students in improving their abilities, thereby equipping them to face everyday challenges and the demands of the future workforce.

One of the media that can be applied in teaching is animated video. Animated videos have been proven effective in supporting numeracy learning as they present material interactively through a combination of visual and audio elements, making it easier for students to grasp the concepts being taught (Alim et al., 2020). Furthermore, studies indicate that the use of animated videos not only captures students' interest but also significantly improves their learning outcomes compared to teaching methods without media aids (Jannah & Julianto, 2018; Purwanto & Rizki, 2015; Wahyuni, 2023). With these advantages, animated videos hold great potential for application in elementary school numeracy education, particularly in helping students comprehend abstract concepts in a more accessible and enjoyable manner.

Several studies on numeracy skills in mathematics education have been conducted using various approaches. For instance, research on Realistic Mathematics Education (RME) has demonstrated its effectiveness in enhancing elementary students' literacy and numeracy through teacher experiences (Fauzan et al., 2023). Similarly, the influence of early numeracy activities at home on fourth-grade students' mathematics achievement has been examined, emphasizing the importance of parental involvement in learning (Balala et al., 2023). Studies on board games have shown that such activities can improve numeracy skills and foster interest in mathematics (Cheung & McBride, 2023), as well as enhance learning outcomes (Hidayah et al., 2023). Other research highlights the role of numeracy skills as a mediator between executive functions and mathematics achievement among elementary school students, underscoring the critical importance of mastering numeracy skills at an early stage of education (Chan & Scalise, 2023). Additionally, various studies have emphasized the use of early assessment tools to identify students with numeracy difficulties, providing valuable insights for developing targeted intervention strategies (Purpura et al., 2023).

Although various approaches to enhancing numeracy skills have been widely discussed, studies specifically evaluating the impact of animated video media on students' numeracy skills remain very limited. In the context of education in Indonesia, particularly under the kurikulum merdeka (freedom curriculum) that emphasizes technology-based learning, there has been little research exploring the potential of

animated video media as an interactive learning tool. This study aims to fill this gap by evaluating the impact of animated video media on improving elementary school students' numeracy skills. Additionally, the research seeks to identify specific elements within animated video media that significantly contribute to enhancing students' numeracy abilities.

METHODS

Design:

This study employs a quantitative approach with a quasi-experimental design. A quasi-experimental design includes a control group but does not fully control external variables that may influence the experimental outcomes (Sugiyono, 2013). The study utilizes a nonequivalent control group design, which involves two groups: an experimental group and a control group. Both groups are administered a pretest and a posttest to evaluate the effectiveness of the intervention.

Participants:

This study was conducted at an elementary school in Lalang, Sungai Apit District. The population consisted of second-grade elementary school students. The research subjects included two classes: Class A, with 16 students as the experimental group, and Class B, with 15 students as the control group, making a total of 31 participants selected through random sampling techniques. The experimental group received instruction using animated video media, while the control group was taught using conventional methods without additional media.

Instruments:

The research instrument consisted of a numeracy skills test designed to measure students' understanding of addition and subtraction operations. The test was administered in two stages: a pretest to assess students' initial abilities before the intervention and a posttest to evaluate the impact of the animated video media on their numeracy skills. Prior to use, the instrument was tested for validity, reliability, difficulty level, and discriminating power (Sugiyono, 2015). Validation was conducted with the involvement of experts to ensure alignment with curriculum standards and learning objective.

Data Analysis:

The collected data were analyzed using statistical procedures. Normality and homogeneity tests were conducted first to ensure the suitability of the data for further analysis. Subsequently, the data were analyzed using an independent samples t-test to determine significant differences between the posttest results of the experimental and control groups. Additionally, the effect size was calculated to evaluate the extent to which the animated video media influenced students' numeracy skills.

RESULTS AND DISCUSSION

Result

The initial numeracy skills of students before the intervention were analyzed using descriptive statistical tests on the pretest results of the experimental and control groups.

This analysis aimed to provide a general overview of the data distribution, including mean scores, standard deviations, minimum values, and maximum values for each group. This information is crucial to ensure that both groups had relatively balanced initial characteristics before the intervention was implemented. The descriptive analysis results of the pretest are presented in Table 1.

Table 1. Descriptive Statistical Analysis *Pretest*

	N	Min	Max	Mean	Std. Deviation	Variance
Pretest Control	15	25	65	44,33	11.475	131.667
Pretest Eksperiment	16	30	65	47,19	10.641	113.229

Based on Table 1, it can be observed that in the experimental class, the maximum score obtained was 65, the minimum score was 30, and the average score was 47.19. Meanwhile, in the control class, the maximum score was 65, the minimum score was 25, and the average score was 44.33. Following the descriptive analysis of the pretest results, a normality test was conducted to determine whether the data were normally distributed. The normality test results for the pretest scores of both classes are presented in Table 2.

Table 2. *Pretest* Normality

	Statistic	Shapiro df	Wilk Sig
Pretest Control	0,946	16	0,433
Pretest Eksperiment	0,939	15	0,356

Table 2 it can be concluded that the normality test results for both the experimental and control classes are > 0.05, indicating that the data are normally distributed. After confirming the normality of the pretest data for both classes, a homogeneity test was conducted to determine whether the abilities of the two classes were homogeneous or heterogeneous. The results of the homogeneity test for the pretest scores are presented in Table 3.

Table 3. *Pretest* Homogenity

	Levene Statistic	df1	df2	Sig.
Pretest Control	0.007	1	29	0,932
Pretest Eksperiment	0.030	1	29	0,865

Based on Table 3, it can be concluded that the significance value of the pretest data for the control class is 0.932, while that for the experimental class is 0.865. This indicates that the variance of the pretest data for both the control and experimental classes is homogeneous (equal) since the significance values are > 0.05. Following the pretest analysis, a posttest was conducted after students completed the learning process using either conventional teaching methods or traditional instruction. The posttest questions had previously been validated. The posttest results represent the students' final learning outcomes, which are used for comparison with the experimental class's final learning outcomes. The results of the posttest are presented in Table 4.

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Table 4. Descriptive Statistical Analysis *Posttest*

	N	Min	Max	Mean	Std. Deviation	Variance
Post-Test Control	15	45	90	73,00	12.071	145.714
Post-Test Experiment	16	70	95	82,81	7.064	49.896

Based on the table, it can be observed that in the experimental class, the maximum score obtained was 95, the minimum score was 70, and the average score was 82.81. In contrast, the control class recorded a maximum score of 90, a minimum score of 45, and an average score of 73.00. Following the descriptive analysis of the posttest results, the researcher conducted normality and homogeneity tests before performing a t-test to examine the proposed hypothesis. The results of the normality test for the posttest scores are presented in Table 5.

Table 5. *Posttest* Normality

	Statistic	Shapiro df	Wilk Sig
Posttest Control	0,936	16	0,300
Posttest Eksperiment	0,920	15	0,191

Table 5 shows that the significance values for the posttest results of both the experimental and control classes are > 0.05, indicating that the posttest data for both classes are normally distributed. Once the data were confirmed to be normally distributed, a homogeneity test was conducted. Table 6 presents the results of the homogeneity test for the posttest scores.

Table 6. *Posttest* Homogenity

	Levene Statistic	df1	df2	Sig.
Posttest Control	3.578	1	29	0,069
Posttest Exsperiment	3.111	1	29	0,088

Based on the table, it can be concluded that the significance value for the posttest data in the control class is 0.069, while the significance value for the posttest data in the experimental class is 0.088. This indicates that the variance of the posttest data for both the control and experimental classes is homogeneous (equal) since the significance values are > 0.05.

The pretest and posttest data have been analyzed, and the results confirm that both datasets meet the assumptions of normality and homogeneity. Meeting these assumptions ensures that the pretest and posttest data can be further analyzed using an Independent Samples T-test. This test will determine whether there is a significant difference between the experimental and control groups after the intervention. The analysis results are presented in Table 7.

Table 7. Independent Sample T Test Score *Pretest and Posttest*

Sample T-test	Sig.
Pretest	0.478
Posttest	0.009

Based on the results of the Independent Samples T-test presented in Table 7, the significance value (Sig.) for the pretest is 0.478 > 0.05, indicating no significant difference between the experimental and control groups in terms of students' initial numeracy skills. This suggests that both groups were balanced in their initial conditions before the intervention, ensuring the validity of the analysis regarding the impact of the treatment.

Meanwhile, the significance value (Sig.) for the posttest is 0.009 < 0.05, demonstrating a significant difference between the experimental and control groups after the intervention. This indicates that the use of animated video media in numeracy learning for the experimental group had a significant impact compared to the conventional teaching methods applied to the control group. These findings support the research hypothesis that animated video media is effective in improving students' numeracy skills. The significant difference in the posttest results also reflects the success of the intervention in fostering a more engaging and effective learning process for students.

Discussion

The analysis results indicate that the introductory phase in learning plays a crucial role in determining student learning success. Teacher-student interaction and reciprocal communication within the learning environment are essential to achieving learning objectives. In this study, the introduction phase involved explaining the learning goals and preparing students to engage with the animated video material specifically designed to teach the concept of fractions. The use of animated video media proved to be an engaging and effective teaching method. This media not only provided a rich visual and auditory experience but also simplified abstract concepts, such as fractions, making them easier for students to understand. Previous studies, such as those by Komang et al. (2018) and Nugroho (2022), also support the effectiveness of animated videos in improving students' numeracy skills.

Findings from Rachmavita (2020) indicate that animated videos can enhance students' motivation in mathematics, which is critical for fostering a positive learning environment. In this study, animated video media facilitated skill development by employing interpretative visuals and symbols designed to convey messages quickly and concisely. Data analysis revealed that the average posttest score of students in the experimental class was higher (82.81) compared to the control class (73.00). The most significant improvement was observed in the ability to interpret analysis for prediction and decision-making, with an increase of 2.16. Conversely, the smallest improvement was noted in the use of numbers and symbols, with an increase of only 0.25, likely due to students' relatively strong initial abilities in this area prior to the intervention.

The significant improvement in the experimental class was influenced by several factors. The use of animated video media provided an interactive learning experience, combining visual illustrations and auditory explanations, which enhanced students' understanding, particularly for those with visual and auditory learning styles. The videos captured students' attention and increased their engagement, creating a more active and enjoyable classroom atmosphere that boosted motivation. Teachers played a pivotal role in guiding students to focus on the material and facilitating post-video discussions, which deepened understanding through social interaction. Additionally, the ability to replay key parts of the video allowed students to revisit challenging concepts, ensuring better comprehension and reinforcing learning for all students.

Despite its success, this study faced technical challenges, such as unstable internet connections when displaying animated videos, which briefly disrupted the learning process. This issue was resolved by downloading the animated videos in advance to ensure smooth delivery during lessons. This obstacle highlights the importance of technological readiness in supporting the use of digital learning media. Overall, the findings of this study align with previous research, such as Sari (2024), which demonstrated significant improvements in students' numeracy skills following the use of video-based instructional media.

The findings of this study highlight the significant potential of animated video media in enhancing student motivation and engagement, as well as improving their understanding of the material. This medium provides a more interactive and engaging learning experience, making it highly relevant to supporting the *kurikulum merdeka*. Thus, this research not only contributes to the academic literature but also offers practical solutions for teachers to create more effective and enjoyable learning environments, particularly in mathematics education. However, this study has limitations, such as a small sample size and a focus on basic numeracy topics. Further research is needed to examine the effectiveness of this media in broader contexts and with more complex subject matter.

Implication

The findings of this study have significant implications for mathematics education in elementary schools, particularly within the context of the *kurikulum merdeka* implementation. The use of animated video media has been proven to enhance students' numeracy skills, offering a solution for teachers to create more interactive, engaging, and relevant learning experiences tailored to students' needs in the digital era. Furthermore, these findings provide a foundation for developing technology-based learning strategies that not only facilitate students' understanding of abstract concepts but also boost their motivation and engagement in the learning process. By leveraging technology such as animated videos, education can effectively support the development of 21st-century skills

CONCLUSIONS

This study demonstrates that the use of animated video media in teaching has a significant impact on improving elementary students' numeracy skills. The analysis results show that the average posttest scores of students in the experimental class were higher than those in the control class. The integration of animated videos facilitated students' understanding of fraction concepts while presenting interactive, engaging, and easily comprehensible material. This success was achieved through a combination of appropriate technology use, active student engagement in the learning process, and the teacher's role in facilitating discussions and reinforcing concepts. Thus, this study highlights that animated video media can serve as an innovative solution to support mathematics learning and contribute to the development of technology-based instructional strategies in elementary education.

AUTHOR CONTRIBUTION STATEMENTS

AR led the design and implementation of the research, conducted data analysis, and drafted the main manuscript. JAA contributed to data collection, statistical analysis, and assisted in writing the manuscript. MF supported the literature review, contributed to the discussion section, and performed the final revisions of the manuscript. All authors read and approved the final version of this manuscript.

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