



The Effect of Animated Video Education on Dental and Oral Health Behavior Among Elementary School Students in Deli Serdang Regency

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ABSTRACT

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Background: Oral health plays an important role in children's overall well-being, influencing their ability to eat, communicate, learn, and participate in daily activities. However, inadequate oral hygiene knowledge and poor oral health practices remain common among school-aged children, increasing the risk of preventable oral diseases. Animated video-based education has emerged as a promising approach because it combines visual and auditory learning elements that can attract children's attention and facilitate understanding. This study aimed to examine the effect of animated video education on oral health maintenance behavior among students at SD Negeri 106785, Sunggal District, Deli Serdang Regency, North Sumatra.

Method: This study employed a pre-experimental design with a one-group pretest-posttest approach. A total of 57 students were recruited using total sampling. Oral health maintenance behavior was assessed using a 10-item questionnaire with acceptable validity (r -value > 0.3601) and reliability (Cronbach's Alpha = 0.777). Data were analyzed using descriptive statistics and simple linear regression to examine the association between the educational intervention and behavioral outcomes.

Result: The mean oral health maintenance behavior score increased from 5.26 before the intervention to 7.23 after the intervention. Statistical analysis showed a significant improvement in behavior following animated video education ($F = 80.882$; $p < 0.001$). The regression model yielded an R^2 value of 0.595, indicating a substantial association between the intervention and post-intervention behavior scores.

Conclusion: Animated video-based education was associated with improved oral health maintenance behavior among elementary school students. The findings suggest that animated videos may serve as an effective and practical educational medium for promoting oral health behaviors in school settings. Further studies using controlled experimental designs are recommended to confirm the effectiveness of this intervention.

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INTRODUCTION

Oral health is an essential component of overall health and well-being because the oral cavity serves as the primary gateway to the digestive system and a potential entry point for various microorganisms that may affect systemic health. Comprehensive health education has been recognized as an effective strategy to address health problems among children, particularly through school-based intervention programs that promote healthy lifestyle behaviors from an early age (Rapotan et al., 2025). Despite advances in preventive health programs, oral health problems remain a major public health concern worldwide. The World Health Organization reported that nearly half of the global population experiences oral diseases, with dental caries remaining the most prevalent chronic condition, especially among children (WHO, 2024; Purba et al., 2022). These challenges are further exacerbated by changes in lifestyle, dietary patterns, and environmental factors, highlighting the importance of early educational interventions that foster healthy oral hygiene behaviors among school-aged children (Nurfaizah & Manalu, 2025).

School-age children represent a critical target group for health promotion initiatives because this developmental stage is characterized by the formation of habits and behaviors that often persist into adulthood (Fauziah et al., 2023). However, maintaining oral hygiene remains a challenge for many children due to inadequate motivation, poor self-care habits, and frequent consumption of sugary foods without appropriate oral cleaning practices. Such behaviors significantly increase the risk of dental caries and other oral health problems (Setiawaty et al., 2024). National data further illustrate the magnitude of this issue. The 2018 Indonesian Basic Health Research (Riskesdas) reported that dental caries affected 81.1% of children aged 3–4 years and 92.6% of those aged 5–9 years (Ministry of Health of the Republic of Indonesia, 2019). Furthermore, approximately 89% of Indonesian children under the age of 12 suffer from dental and oral diseases that negatively impact their health, growth, and development (Putri et al., 2024). These findings indicate that oral health problems among Indonesian children remain alarmingly high and require innovative preventive strategies.

Health education plays a fundamental role in promoting healthy behaviors because it not only improves knowledge but also facilitates sustainable behavioral changes that enable individuals to maintain and enhance their health independently (Siregar et al., 2020). In the context of elementary school children, educational approaches should be adapted to their cognitive and developmental characteristics to ensure effective message delivery and retention. Traditional health education methods that rely primarily on verbal explanations are often insufficient to maintain children's attention and engagement. Consequently, educational media that are attractive, interactive, and easy to understand have become increasingly important in health promotion programs (Aidha et al., 2023).

Among various educational media, animated videos have emerged as a promising tool for health education because they combine visual and auditory elements that can enhance learning experiences and improve message retention. Children naturally show greater interest in animated content, which not only serves as entertainment but also functions as an effective learning medium that enhances comprehension and recall of educational messages (Fione et al., 2021). Animated videos possess several advantages, including high visual appeal, the ability to stimulate imagination, and greater effectiveness in attracting children's attention compared to static images or conventional teaching methods (Imamah et al., 2023). Previous studies have demonstrated that visual learning approaches using animated videos can significantly improve children's knowledge, attitudes, and practices related to oral health maintenance by engaging multiple sensory channels simultaneously (Setiawaty et al., 2024). Educational videos also enable educators to present experiences and information that may be difficult to demonstrate directly in classroom settings, thereby facilitating children's understanding and imitation of desirable health behaviors (Krisnanto et al., 2025).

The effectiveness of animated videos can be explained through Mayer's Multimedia Learning Theory, which posits that learning becomes more effective when information is presented through a combination of words, images, animation, and audio rather than through verbal explanations alone (Nurhatmi, 2025). According to this theory, learners process information through both visual and auditory channels, resulting in improved understanding, retention, and application of knowledge. In the context of oral health education, animated videos can facilitate the delivery of complex health messages in a format that is more engaging and comprehensible for elementary school students. Consistent with this perspective, Moe-Byrne et al. (2023) emphasized that animated media not only conveys information effectively but also stimulates curiosity and strengthens memory, thereby increasing the likelihood of positive behavioral change.

The use of animated videos in health promotion can also be understood through Lawrence Green's PRECEDE-PROCEED Model, which explains that health behavior is influenced by predisposing, enabling, and reinforcing factors (Firdaus et al., 2023). Knowledge and attitudes function as predisposing factors that motivate individuals to adopt healthy behaviors, while educational media serve as enabling factors that facilitate access to health information. Furthermore, support from teachers, parents, and peers acts as reinforcing factors that sustain positive behavioral changes. Therefore, animated video-based education has the potential to influence oral health behavior by simultaneously addressing multiple determinants of behavior change.

Several studies have reported the effectiveness of animated video interventions in oral health education. Krisnanto et al. (2025) found that animated video-based education significantly improved preschool children's oral health knowledge. Similarly, Wahyuni et al. (2024) reported substantial improvements in students' understanding of oral health maintenance following educational interventions using animated videos. Haloho et al. (2025) further demonstrated that animated videos effectively enhanced elementary school students' knowledge of proper toothbrushing techniques. Collectively, these findings suggest that animated videos are a valuable educational medium for improving oral health awareness among children.

Nevertheless, important research gaps remain. Most previous studies have primarily focused on improving knowledge and attitudes following educational interventions, whereas behavioral outcomes the ultimate objective of health promotion have received less attention. Increased knowledge does not necessarily translate into sustainable behavioral changes in daily life. Moreover, existing studies often evaluate only specific aspects of oral health behavior, such as toothbrushing skills or knowledge of appropriate brushing times, rather than examining oral health behavior comprehensively. Research that evaluates multiple dimensions of oral health behavior, including regular toothbrushing practices, proper brushing techniques, the use of fluoride toothpaste, and preventive behaviors against dental caries among elementary school children, remains limited.

In addition, most studies investigating animated video-based oral health education have been conducted in urban settings or specific regions such as Batam, Malang, and Tuban. Scientific evidence regarding the effectiveness of this educational approach among elementary school students in Deli Serdang Regency, North Sumatra, remains scarce. Differences in sociocultural characteristics, educational environments, and access to health information may influence intervention outcomes, thereby limiting the generalizability of previous findings to this population.

Preliminary observations conducted at SD Negeri 106785 in Sunggal Subdistrict, Deli Serdang Regency, revealed several oral health concerns among students. Many students reported brushing their teeth only during morning showers and rarely before bedtime. Some admitted that they often forgot or lacked motivation to brush their teeth regularly. Limited understanding regarding the appropriate timing and importance of toothbrushing was also observed. Furthermore, students frequently consumed sugary foods and beverages, including candies, chocolates, sweet snacks, and packaged drinks, without practicing adequate oral hygiene afterward.

These behaviors increase the risk of dental caries and other oral health problems. Observations also indicated that conventional verbal advice from teachers and parents regarding oral health was often ignored because students perceived it as uninteresting and difficult to understand.

Given these circumstances, there is a clear need for innovative and engaging educational approaches that align with children's learning preferences and developmental characteristics. Animated videos offer an interactive multimedia learning experience that may improve students' understanding, retention, and application of oral health practices in their daily lives. Therefore, this study aims to investigate the effect of animation-based education on oral health behaviors among students at SD Negeri 106785 in Sunggal Subdistrict, Deli Serdang Regency, North Sumatra. The findings are expected to contribute to the growing body of evidence regarding the effectiveness of multimedia-based health promotion strategies and provide practical implications for the development of school-based oral health education programs.

METHOD

Research Design

This study employed a quantitative approach using a pre-experimental one-group pretest-posttest design to assess changes in students' oral health maintenance behaviors following an educational intervention delivered through animated videos. This design was selected as a preliminary evaluation method to determine whether the intervention was associated with measurable behavioral improvements before and after exposure to the educational content. The absence of a control group was considered acceptable for this initial investigation because the primary objective was to explore the potential effectiveness of animated video-based education in a real school setting. However, it is acknowledged that the lack of a comparison group limits the ability to attribute observed changes exclusively to the intervention, as external factors and maturation effects may have influenced the outcomes. Therefore, the findings should be interpreted with caution, and future studies employing quasi-experimental or randomized controlled designs are recommended to provide stronger evidence regarding the effectiveness of animated video education on oral health maintenance behaviors among elementary school students.

Participant

The study participants were students enrolled at SD Negeri 106785, Sunggal District, Deli Serdang Regency, North Sumatra, Indonesia. A total of 57 students from grades III, IV, and V participated in the study. Total sampling was employed because the number of eligible students within the target population was relatively small and manageable, allowing all students who met the eligibility criteria to be included. This approach was intended to maximize population representation and minimize sampling bias. Eligible participants were required to be actively enrolled at the school, willing to participate in the study, and able to complete both the pretest and posttest assessments. Consequently, all 57 eligible students were included in the final analysis.

Procedures and Time Frame

Data collection was conducted from April to May 2026 at SD Negeri 106785, Sunggal District, Deli Serdang Regency, North Sumatra. The study was implemented in three stages. During the first stage, participants completed a pretest questionnaire to assess baseline oral health maintenance behaviors. In the second stage, students received an educational intervention through an animated video specifically developed for elementary school children. The video had a duration of approximately 10–15 minutes and contained educational content on the importance of oral health, proper toothbrushing techniques, recommended toothbrushing frequency and timing (after breakfast and before bedtime), the use of fluoride toothpaste, healthy dietary habits, and strategies

for preventing dental caries. The video combined colorful animations, narration, text, and practical demonstrations to enhance students' understanding and engagement.

The intervention was delivered in a classroom setting using a projector and audio system under the supervision of the researchers and classroom teachers. Before the video presentation, students were given a brief introduction to the learning objectives. Following the video session, researchers conducted a short interactive discussion and question-and-answer session to reinforce key messages and ensure participants understood the educational content. In the third stage, participants completed the same questionnaire as a posttest immediately after the intervention to evaluate changes in oral health maintenance behaviors following exposure to the animated video education.

Ethical Considerations

Ethical approval for this study was obtained from the Research Ethics Committee (KEP) of Institut Kesehatan Medistra Lubuk Pakam (Ethical Clearance No. 083.D/KEP-MLP/VI/2026). Written informed consent was obtained from parents or legal guardians, and verbal assent was obtained from all participating students. Participation was voluntary, and all data were kept confidential and used exclusively for research purposes.

RESULTS AND DISCUSSION

Results

Prior to data collection, the questionnaire used to assess oral health maintenance behavior was subjected to validity and reliability testing. The instrument consisted of 10 items covering key aspects of oral health behavior, including toothbrushing frequency, appropriate toothbrushing timing, use of fluoride toothpaste, and other oral hygiene practices. Item validity was evaluated using Pearson Product-Moment correlation analysis, with all items demonstrating correlation coefficients exceeding the critical value ($r > 0.3601$), indicating that each item was valid for measuring the intended construct. Instrument reliability was assessed using Cronbach's Alpha coefficient, yielding a value of 0.777, which exceeded the minimum acceptable threshold of 0.70. These findings indicate that the questionnaire possessed satisfactory validity and internal consistency, making it suitable for assessing oral health maintenance behavior among elementary school students.

Descriptive Statistical Test

Table 1. Descriptive Statistics

Variable	n	Min	Max	Mean \pm SD
Pre-test	57	1	10	5.26 \pm 2.55
Post-test	57	2	10	7.23 \pm 1.77

Table 1 shows the distribution of oral health maintenance behavior scores before and after the intervention. The mean pre-test score was 5.26 ± 2.55 , while the mean post-test score increased to 7.23 ± 1.77 . These findings indicate an improvement in oral health maintenance behavior among students following the animated video-based educational intervention. In addition, the lower standard deviation observed in the post-test suggests greater consistency in students' oral health behaviors after the intervention.

Bivariate Analysis

Table 2. Results of Simple Linear Regression Analysis

Variable	R	R ²	Adjusted R ²	F	p-value	Std. Error
Pretest → Posttest	0.772	0.595	0.588	80.882	<0.001	1.138

Table 4 presents the results of the simple linear regression analysis examining the relationship between pretest and posttest oral health maintenance behavior scores. The analysis demonstrated a strong positive association ($R = 0.772$) between the two measurements. The coefficient of determination ($R^2 = 0.595$) indicates that 59.5% of the variation in posttest scores was associated with variation in pretest scores. The regression model was statistically significant ($F = 80.882$, $p < 0.001$), suggesting that the model adequately explained the observed changes in oral health maintenance behavior scores. The adjusted R^2 value of 0.588 indicates that the model retained substantial explanatory power after adjustment for sample size.

Discussion

The findings of this study demonstrated an improvement in students' oral health maintenance behavior following the animated video-based educational intervention. The mean oral health behavior score increased from 5.26 before the intervention to 7.23 after the intervention, indicating that students exhibited better oral health practices after receiving the educational program. This finding suggests that animated video media can facilitate the delivery of oral health information in a manner that is engaging, understandable, and appropriate for elementary school students.

The regression analysis further revealed a statistically significant association between pretest and posttest scores ($F = 80.882$; $p < 0.001$). The coefficient of determination ($R^2 = 0.595$) indicates that 59.5% of the variation in posttest scores was associated with variation in the measured variables included in the model, while the remaining 40.5% may be influenced by other factors not examined in this study, such as family environment, daily habits, peer influence, and support from teachers and parents. Given the pre-experimental design without a control group, these findings should be interpreted as evidence of a significant association rather than definitive proof of causality.

The observed improvement in oral health behavior can be explained through the Stimulus–Organism–Response (S-O-R) Theory proposed by Burrhus Frederic Skinner. According to this theory, a stimulus received by an individual is processed internally and subsequently generates a behavioral response (Abidin, 2021). In the present study, the animated video functioned as the stimulus by delivering information regarding oral hygiene practices, proper toothbrushing techniques, and preventive oral health behaviors. Through the integration of visual and auditory elements, students were able to process the information more effectively, resulting in positive behavioral responses related to oral health maintenance. Animated videos that incorporate moving images, colors, narration, and attractive storylines are generally more engaging than conventional educational approaches, thereby facilitating greater attention and comprehension among children (Zahroh et al., 2025).

These findings are also consistent with Social Learning Theory proposed by Albert Bandura, which emphasizes that individuals acquire new behaviors through observation and imitation of role models (Pramudiantoro et al., 2025). The animated video used in this study presented demonstrations of desirable oral health behaviors, including proper toothbrushing techniques, limiting sugary food consumption, and maintaining routine dental care. By observing these modeled behaviors, students were provided with opportunities to learn and subsequently adopt similar practices in their daily lives.

Furthermore, the results support Lawrence Green's health promotion framework, which states that behavioral change is influenced by predisposing factors such as knowledge, attitudes, and beliefs (Bernadetha et al., 2023). Educational interventions delivered through animated videos

may enhance students' knowledge and awareness regarding oral health, which in turn can encourage the adoption of healthier behaviors. This explanation is supported by Ariga (2022), who reported that improved knowledge is often associated with greater engagement in healthy lifestyle practices.

The present findings are in agreement with previous studies demonstrating the effectiveness of animated videos as a health education medium. Aisah et al. (2021) and Taryzafitri et al. (2025) reported that animated video-based education improved knowledge, attitudes, and health-related behaviors among school-aged children. Similarly, Zahroh et al. (2025) found that audiovisual learning media are more effective in attracting children's attention and facilitating message retention compared with conventional educational approaches. These findings suggest that animated videos provide an interactive learning experience that enhances both engagement and understanding of health information.

From a developmental perspective, the effectiveness of animated videos may also be attributed to the cognitive characteristics of elementary school students, who are generally in the concrete operational stage of development. At this stage, children tend to learn more effectively through visual representations, demonstrations, and concrete examples rather than abstract explanations. Consequently, animated videos offer an appropriate educational medium because they combine instructional content with entertaining elements, making health messages more accessible and memorable for young learners (Kusuma et al., 2025).

Despite these promising findings, several limitations should be acknowledged. The study employed a one-group pretest-posttest design without a control group, limiting the ability to attribute behavioral changes exclusively to the intervention. In addition, the relatively short observation period may not fully capture the sustainability of behavioral changes over time. Future studies using quasi-experimental or randomized controlled designs with longer follow-up periods are recommended to provide stronger evidence regarding the effectiveness of animated video-based oral health education.

Overall, the findings indicate that animated video-based education is associated with improved oral health maintenance behavior among elementary school students. These results highlight the potential of animated videos as a practical and engaging health promotion strategy for school settings. By fostering positive oral health behaviors from an early age, such interventions may contribute to reducing the risk of dental caries, plaque accumulation, and other oral health problems among children.

Implications

The findings suggest that animated educational videos can serve as an effective health promotion strategy for improving oral health behaviors among elementary school students. Schools can integrate animated educational media into health education programs to encourage the development of healthy oral hygiene habits from an early age.

Limitations

It is important to acknowledge several constraints. Primarily, the investigation employed a pre-experimental methodology lacking a control cohort, thereby restricting the conclusive determination of a causal link. Secondly, the research was undertaken within a singular educational institution, employing a modest participant pool, which consequently restricts the extent to which the outcomes can be broadly applied. Thirdly, the assessment of behavioral results relied upon self-administered questionnaires, a method potentially susceptible to conscious or unconscious reporting inaccuracies.

CONCLUSION

Based on the results of a study conducted on 57 students at SD Negeri 106785 in Sunggal Subdistrict, Deli Serdang Regency, North Sumatra, it can be concluded that education using animated videos has a significant effect on oral health-promoting behaviors. This is indicated by an increase in the average score from 5.26 on the pretest to 7.23 on the posttest. The regression test results show that the calculated F-value of 80.882 is greater than the critical F-value of 4.02 with a significance level of $0.000 < 0.05$, so the research hypothesis is accepted. Furthermore, the coefficient of determination (R^2) of 0.595 indicates that education using animated videos explains 59.5% of the variation in changes in oral health maintenance behavior among students, while the remaining variation is influenced by other factors outside the scope of this study. Thus, animated videos have proven effective as a health education medium in improving oral health maintenance behavior among elementary school students.

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