

INNOVATION OF ANIMATED MEDIA ASSISTED BY THE CANVA APPLICATION AS A CATALYST FOR IMPROVING SCIENCE LEARNING OUTCOMES

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Abstract

This study examines the effectiveness of Canva-assisted animated audio-visual media in improving elementary school students' science learning outcomes on the topic of force. The novelty of this research lies in the integration of animated instructional videos created through the Canva application as an innovative medium for elementary science learning. The study employed a quantitative approach using a quasi-experimental method with a pretest–posttest control group design. The participants consisted of 40 fourth-grade students at SD Kristen Nuruwe, divided into an experimental class and a control class. Data were collected through learning achievement tests and observation sheets, then analyzed using the Shapiro–Wilk normality test, Levene's homogeneity test, and independent samples t-test. The findings revealed that the post-test significance value (Sig. 2-tailed) was .710, which was higher than the significance level of .05. This indicates that there was no statistically significant difference between the learning outcomes of students in the experimental class and those in the control class. However, the experimental class demonstrated a greater increase in average learning outcomes and showed higher student participation during the learning process. These findings suggest that Canva-assisted animated media contributed positively to the learning experience, although the effect was not statistically significant. In conclusion, technology-based instructional media alone cannot guarantee improved learning outcomes. Their effectiveness depends on instructional design, teaching strategies, student engagement, and the overall learning environment. Therefore, Canva-assisted animated media has the potential to become an innovative alternative for elementary science learning when supported by appropriate pedagogical implementation.

Keywords: audio-visual media, animated video, Canva application, science learning outcomes, elementary school learning

INTRODUCTION

Entering the 21st century, the needs of elementary school students have undergone significant changes. Students are no longer sufficiently served by passively receiving information through

teacher-centered lectures; instead, they require active, meaningful, and technology-based learning experiences. Twenty-first-century competencies, which include critical thinking, creativity, communication, and collaboration skills, have become essential demands that must be addressed by the education system, including at the elementary school level. To meet these needs, innovation in the use of learning media has become a necessity for every teacher. In line with the rapid advancement of technology, traditional teaching methods are increasingly considered less effective for learners and are gradually being replaced by interactive learning environments integrated with technology (Koç & Kanadlı, 2025). Interactive learning environments are systems designed through the utilization of various specialized software and hardware to support the learning process in educational institutions (Timotheou et al., 2023). Unlike conventional approaches, these environments require more active student participation and engage multiple senses throughout the learning process. The growing use of digital technology in everyday life has also encouraged its widespread application in educational activities (Pivec, 2007; Kordaki, 2010). In this technology-based learning context, students are not merely recipients of information but also actively interact with various stimuli provided by the technological applications used, making them more engaged in the learning process. As the implementation of interactive learning continues to expand (Yeh et al., 2012), teachers play a role in designing and delivering technology-based materials, while students contribute by constructing and sharing knowledge (Zafeer et al., 2025). This modern learning environment, as an alternative to conventional methods, also requires educators to continuously explore and implement the latest digital tools and applications in their teaching practices (Al-Mashhadani & Al-Rawe, 2018).

The low achievement in science learning is not merely a matter of students' abilities, but also reflects the limitations of the teaching strategies and learning media used by teachers. One of the causes of inadequate science instruction in elementary schools is that teachers often possess limited content knowledge, which reduces their confidence in teaching the subject. For instance, some elementary school teachers struggle to understand scientific concepts (Hoban & Nielsen, 2013). Furthermore, although certain teaching strategies are considered highly beneficial for student learning, previous studies have generally focused more on the overall impact of interventions without paying sufficient attention to individual variations in teachers' instructional support and their influence on learning outcomes (Heppt et al., 2023). To address this gap, the present study examines the relationship between instructional support in technology-based science learning in elementary schools and improvements in students' learning outcomes, while taking into account their science content knowledge and academic language abilities. Children typically develop a comprehensive understanding of ideas through observing, exploring, touching, tasting, and manipulating objects (Lichene & Lichene, 2019). Moreover, by enabling children to learn science from an early age, they can improve their ability to apply scientific processes and, consequently, enhance their understanding of new topics (Roy et al., 2025). Similarly, Ramadhani et al. (2019) found that children can develop mastery of scientific skills when they are provided with ample opportunities to engage in hands-on activities. Such experiences allow them to formulate hypotheses and conduct experiments collaboratively. Therefore, by involving children in practical activities, such as carrying out science projects from an early age, they can effectively acquire new knowledge about the world around them (Yilmaz et al., 2024). One way to address this issue is to engage prospective elementary school teachers in experiencing new ways of representing scientific knowledge during their teacher preparation programs.

These challenges have encouraged educators to shift toward the use of technology-based learning media. One type of media that is highly relevant to the demands of the 21st century is audio-visual media in the form of animated videos. Recent studies indicate that technology-supported science education can personalize learning experiences and enhance problem-solving skills (Zhao, 2021). Equitable access to such technology helps ensure that all students have the opportunity to excel in science. In addition, empowering children through the use of hardware and software in the classroom is considered a best practice for helping them improve their critical thinking skills (Ghazali et al., 2024). Educational technology holds great promise for improving learning outcomes in higher education; however, its success depends on thoughtful implementation, pedagogical alignment, and

continuous support for educators (Akintayo et al., 2024). The use of technology in educational programs yields the most optimal results when it is focused on self-directed learning or aimed at strengthening the teaching process, for example through the application of structured pedagogy that provides systematic guidance and continuous feedback for teachers (Rodriguez-segura, 2022). For instance, Muralidharan et al. (2019) found that the use of technology to personalize learning materials for students through the Mindspark program in India significantly improved mathematics and reading achievement at a relatively low cost. Furthermore, Pakistan faces a critical gap in preparing its education system to meet the demands of STEM education (science, technology, engineering, and mathematics), which is essential for fostering innovation and competitiveness in the 21st-century global economy (Rehman et al., 2025). Findings from the study by Hoop et al. (2024) also demonstrate that various technology-assisted teaching programs can improve learning outcomes even in the poorest rural areas of sub-Saharan Africa. Moreover, based on Jean Piaget's stages of cognitive development, elementary school students aged 7–12 years are in the concrete operational stage, meaning they require visual media capable of concretizing abstract concepts such as force in science learning.

Online learning, or e-learning, requires a more optimal utilization of visual media platforms within the context of 21st-century education, where digital technology is employed to create deeper and more effective learning experiences. The integration of technology has been proven to enhance the effectiveness of learning processes across various aspects of education (Reiners et al., 2005). According to Olcott (2021), the 21st century presents major scientific challenges in managing, processing, and utilizing the vast amount of information generated by advances in modern data collection systems and computing technologies. Students not only use technology for entertainment but also as a learning tool that influences the way they think, learn, and interact. On the other hand, the use of technology also demonstrates students' potential and skills within digital environments. As time progresses, various multimedia platforms have been implemented in nearly all areas of education, enabling them to accommodate diverse student learning styles while supporting the presentation and understanding of material more effectively. Multimedia is regarded as an approach that offers significant advantages in improving the learning process. Multimedia refers to a method of presenting material that combines verbal and visual elements (Mayer, 2002). Therefore, content design should be tailored to students' needs and targeted learning outcomes, and it should ideally be implemented within an appropriate environment in order to foster interest and learning motivation (Schnotz et al., 2009). Previous studies have also revealed that the strength of multimedia lies in its ability to utilize humans' natural information-processing mechanisms (Reddi & Mishra, 2003). The integration of verbal and visual materials can help students understand a topic more effectively (Shinta et al., 2019). Furthermore, as stated by Dalal (2014), multimedia-based learning offers various benefits, one of which is flexibility in accommodating individual needs related to time, place, and learning pace. Findings from Taiwan by Mou (2023) indicate that children consistently demonstrate positive attitudes toward science learning and the integration of animation. In addition, children highly appreciate the simulation features and dynamic visualizations provided by animations, which enhance their understanding of scientific concepts. Certain animation elements can further improve the effectiveness of science learning. This understanding has the potential not only to improve educational animation in media but also to enhance traditional teaching practices in schools and universities (Beautemps et al., 2025). Moreover, the findings of Khalid et al. (2010) show that more than 70% of teacher respondents held positive views regarding the impact of cartoons in teaching and learning. Teachers perceived that learning through cartoon media could create a positive learning environment for students while also stimulating their imagination and creativity.

In this context, Canva emerges as a digital design application that enables teachers to create engaging, interactive, and user-friendly visual learning media. On the other hand, a systematic review conducted by Firdayanti et al. (2024) emphasizes that the use of Canva plays a significant role in enhancing students' critical thinking skills, technical abilities, aesthetic appreciation, and creativity. This is supported by the wide range of visual resources available and its user-friendly interface. They also highlighted the need for professional development for educators and curriculum adjustments to ensure

the optimal integration of the platform into education. In line with these findings, Hutapea et al. (2024) stated that the use of Canva-based digital media has a positive impact on learning outcomes, motivation, and students' critical and creative thinking skills at the elementary school level. Canva offers a transformative approach to education by promoting 21st-century skills and bridging traditional learning with digital literacy. This is further reinforced by the findings of Astaño (2025), which demonstrate that Canva has a highly significant positive effect on students' academic achievement. Research also indicates that platforms such as Canva facilitate deeper understanding and engagement by enabling students to visualize abstract ideas and collaborate in content creation. The interactive and creative nature of Canva is also aligned with constructivist and participatory learning models, encouraging students to take an active role in their learning journey (Abidin et al., 2025). Thus, the integration of animated videos as learning media with Canva as the platform for their creation represents an innovative breakthrough that deserves further investigation through empirical research. Therefore, this study aims to examine the effect of using audio-visual animated video media assisted by the Canva application on students' science learning outcomes.

METHOD

This study employed a quantitative approach, which is a research method that emphasizes objective data measurement and statistical analysis to test previously formulated hypotheses. The type of research used was a quasi-experimental design, chosen because the researcher did not have full control over randomly assigning subjects into research groups, yet still sought to examine causal relationships through a specific treatment. The research design applied in this study was the pretest-posttest control group design. This design is a form of experimental research involving two groups: an experimental group that receives the treatment and a control group that does not receive the treatment and serves as a comparison. Both groups were initially given a pretest to determine their baseline conditions before the treatment was administered. Subsequently, after the experimental group received the treatment according to the variables being studied, both groups were given a posttest. By comparing the pretest and posttest results between the two groups, the researcher was able to analyze the effect of the treatment and determine whether there was a significant difference between the experimental group and the control group as a result of the applied treatment.

The population in this study consisted of all fourth-grade students at SD Kristen Nuruwe who served as the research subjects. The selection of this population was based on the suitability of the students' characteristics with the objectives of the study, particularly in examining the effectiveness of using specific instructional media at the elementary school level. The research sample consisted of 40 students selected from the population and subsequently divided into two different groups or classes. This division was carried out to compare learning outcomes between the group receiving the treatment and the group not receiving the treatment. The experimental class consisted of 20 students from Class IV B, who received instruction using audio-visual learning media in the form of animated videos designed and presented with the assistance of the Canva platform. This media was chosen because it was considered capable of increasing student engagement, facilitating understanding of the material, and providing a more interesting and interactive learning experience. Meanwhile, the control class also consisted of 20 students from Class IV A, who participated in the learning process through conventional teaching methods without the use of the audio-visual media. The conventional learning method focused primarily on lectures, question-and-answer sessions, and the use of textbooks as the main learning resource. Through this division, the researcher was able to compare the learning outcomes of both groups more objectively in order to determine the effect of using Canva-assisted animated video media on improving students' learning outcomes.

The instruments used in this study consisted of two types, namely test and non-test instruments, which were designed to obtain comprehensive data regarding students' learning outcomes and activities during the learning process. The test instrument used was a learning achievement test in the form of 14 multiple-choice questions. These questions were developed based on predetermined learning indicators and covered the topic of Force, enabling the researcher to objectively measure students' level of understanding of the material taught. Each item was designed by considering content validity

and its suitability with the cognitive development level of elementary school students. In addition to the test instrument, this study also employed a non-test instrument in the form of a student activity observation sheet. This observation sheet was used to monitor and record the level of student engagement during the learning process in both the experimental and control classes. The observed aspects included students' participation in learning activities, attention to the teacher's explanations, activeness in asking or answering questions, and involvement in the use of learning media. The data obtained from the observation sheets were expected to provide a deeper understanding of the learning process, thereby complementing the analysis results derived from the learning achievement tests that had been conducted.

The data collection techniques employed in this study were carried out through three main methods, namely tests, observation, and documentation, which complemented one another in obtaining accurate and comprehensive data. First, the test technique was used to measure students' cognitive abilities before and after the treatment was administered. The tests were conducted in the form of pretests and posttests to determine the improvement in students' learning outcomes and to examine the effect of the treatment given to the experimental class compared to the control class. Second, the observation technique was conducted to monitor students' activities during the learning process. This observation aimed to identify the level of students' engagement, participation, and responses toward the implemented learning process in both the experimental and control classes. Through observation, the researcher was able to obtain a more realistic picture of the classroom learning dynamics, which could not be measured solely through tests. Third, the documentation technique was used to collect supporting data relevant to the study. The documentation data included school archives, student attendance lists, and photographs of learning activities conducted during the research process. This documentation served as evidence of the implementation of the study while also strengthening the data obtained from the tests and observations. The learning media used in this study consisted of animated videos created with the assistance of the Canva application. This media was designed to present learning materials in a more engaging, interactive, and easily understandable manner for students. The animated videos can be accessed through the following link: <https://canva.link/10xfs0gzk77bukh>, allowing them to be reused as learning resources by both teachers and students outside the scope of the research activities.

The data in this study were analyzed through several systematic stages to ensure the accuracy and validity of the research findings. The initial stage of analysis involved prerequisite tests, namely the normality test and the homogeneity test. The normality test was conducted using the Shapiro–Wilk test to determine whether the obtained data were normally distributed. Meanwhile, the homogeneity test was performed using Levene's test to ensure that the variances of the data from both groups (the experimental class and the control class) were homogeneous or equivalent. After fulfilling the prerequisite tests, the analysis proceeded with hypothesis testing using the Independent Samples T-Test. This test was used to determine whether there was a significant difference between the learning outcomes of students in the experimental class and those in the control class after the treatment was administered. Therefore, the results of this test could indicate the effectiveness of the implemented instructional media. In addition, to measure the level of improvement in students' learning outcomes, the N-Gain or Normalized Gain effectiveness test was employed. This test aimed to determine the extent of students' improvement from before to after the learning process. The interpretation criteria for the N-Gain values are as follows: a value of $g \geq .70$ is categorized as high improvement, a value of $.30 < g < .70$ is categorized as moderate improvement, and a value of $g \leq .30$ is categorized as low improvement (Hake, 1998). By using these analyses, the researcher could provide a clearer description of the effectiveness of the treatment in improving students' learning outcomes.

RESULTS

Normality Test

Before conducting the hypothesis testing, a prerequisite analysis in the form of a normality test was carried out. The normality test aimed to determine whether the students' learning outcome data from

the pre-test in both the control class and the experimental class were normally distributed. This test is important because it serves as a requirement for the use of parametric statistical analysis. In this study, the normality test was conducted using the Shapiro–Wilk test with the assistance of the SPSS program, since the sample size was fewer than 50 students. The results of the normality test for the students' pre-test scores can be seen in Table 1 below.

Table 1. Normality Test of Pre-test Scores

Class	Variabel	Test of Normality Shapiro-Wilk Statistic	df	Sig.
Control	Learning	.960	20	.542
Experimental	Outcomes	.970	20	.749

Based on the output table above, it is known that the df (degrees of freedom) for the control class is 20 and for the experimental class is also 20. This means that the number of data samples in each class is fewer than 50. Therefore, the use of the Shapiro–Wilk technique to detect the normality of the data in this study can be considered appropriate. Furthermore, the output shows that the Sig. value for the control class is .542, while the Sig. value for the experimental class is .749. Since the Sig. values for both classes are greater than .05, based on the decision-making criteria in the Shapiro–Wilk normality test, it can be concluded that the students' learning outcome data in both the control class and the experimental class are normally distributed.

Table 2. Normality Test of Post-test Scores

Variable	Class	Test Of Normality Shapiro-Wilk Statistic	df	Sig.
Learning	Control	.969	20	.738
Outcomes	Experimental	.965	20	.647

Based on the output above, it is known that the df (degrees of freedom) for the control class is 20 and for the experimental class is also 20. This means that the number of data samples in each class is fewer than 50. Therefore, the use of the Shapiro–Wilk technique to test the normality of the data in this study is considered appropriate. In addition, the output indicates that the Sig. value for the control class is .738, while the Sig. value for the experimental class is .647. Since the Sig. values for both classes are greater than .05, based on the decision-making criteria of the Shapiro–Wilk normality test, it can be concluded that the students' learning outcome data in both the control class and the experimental class are normally distributed.

Hypothesis Testing

After the data were confirmed to be normally distributed and met the analysis requirements, a hypothesis test was conducted to determine whether there was a difference in the mean pre-test scores between the control class and the experimental class before the treatment was administered. The hypothesis testing in this study used the Independent Samples T-Test with the assistance of the SPSS program. This test aimed to ensure that the initial abilities of both classes were balanced. The results of the pre-test hypothesis testing can be seen in Table 3.

Table 3. Results of the Pre-test Hypothesis Test

Independent Samples Test					
Levenes's Test for Equality of Variances					
		Sig.		df	Sig. (2-tailed)
Pre-test Results	Equal variances assumed	.056	.638	38	.110
	Equal variances not assumed		.638	37.909	.110

Independent T-Test of Pre-test Scores

Based on the results of the homogeneity test using Levene's Test, the significance value obtained was .815. Since this value is greater than .05, it can be concluded that the pre-test score data of the experimental and control classes had homogeneous variances. Therefore, the hypothesis testing was continued using the independent t-test on the "equal variances assumed" row. The results of the independent t-test showed that the Sig. (2-tailed) value was .110. Since this value is greater than the significance level of .05, H_0 was accepted and H_1 was rejected. Thus, it can be concluded that there was no significant difference in the mean pre-test scores between the experimental class and the control class.

Table 4. Results of the Post-test Hypothesis Test

Independent Samples Test					
Levenes's Test for Equality of Variances					
			Sig.	df	Sig. (2-tailed)
Post-test Results	Equal variances assumed	.061	.088	38	.710
	Equal variances not assumed			33.506	.710
				375	

Independent T-Test of Post-test Scores

Based on the results of the homogeneity test using Levene's Test, the significance value obtained was .088. Since this value is greater than 0.05, it can be concluded that the post-test score data of the experimental and control classes had homogeneous variances. Therefore, the hypothesis testing was conducted using the independent t-test on the "equal variances assumed" row. The results of the independent t-test showed that the Sig. (2-tailed) value was .710. Since this value is greater than the significance level of .05, H_0 was accepted and H_1 was rejected. Thus, it can be concluded that there was no significant difference in learning outcomes between the experimental class using audio-visual animated video media assisted by the Canva application and the control class using conventional learning methods.

Effectiveness Test (N-Gain)

Based on the results of the N-Gain analysis, the control class obtained an average N-Gain score of .33, which falls into the moderate category, while the experimental class obtained an average N-Gain score of .41, also categorized as moderate. Although both classes were in the same category, the average N-Gain score of the experimental class was higher than that of the control class. In terms of the N-Gain category distribution, the proportion of students in the moderate category in the experimental class (45%) was higher than that in the control class (30%). In addition, the proportion of students in the low category in the experimental class (45%) was lower than that in the control class (60%). This indicates that the improvement in learning outcomes in the experimental class was more evenly distributed than in the control class. Therefore, based on the N-Gain analysis, it can be concluded that the use of audio-visual animated video media assisted by the Canva application was more effective in improving students' learning outcomes compared to conventional learning methods, as indicated by the higher average N-Gain score of the experimental class (.41) compared to the control class (.33).

Table 5. Comparison of N-Gain Scores between the Control Class and the Experimental Class

Comparison Aspect	Control Class	Experimental Class
Number of Students	20	20
Average Pre-test Score	57.4	49.5
Average Post-test Score	71.3	70.05
Average Increase	13.9	20.55
Average N-Gain Score	.33	.41
High Category	2 students (10%)	2 students (10%)
Moderate Category	6 students (30%)	9 students (45%)
Low Category	12 students (60%)	9 students (45%)

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

The results of the data analysis using an independent samples t-test showed that the significance value (Sig. 2-tailed) was .710. This value is higher than the predetermined significance level of .05. Based on the decision-making criteria in hypothesis testing, this condition indicates that the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. Therefore, it can be concluded that there is no significant difference in the average learning outcomes between the experimental class, which used audio-visual learning media in the form of animated videos assisted by the Canva application, and the control class, which used conventional learning methods. These findings indicate that, statistically, the treatment in the form of audio-visual media use was not able to produce a significantly different impact on students' learning outcomes. Any differences in the average scores that may have appeared descriptively were not strong enough to exceed the significance threshold, suggesting that such differences were more likely caused by random variation rather than by the treatment effect. In the context of quantitative research, this condition indicates that the intervention effect was relatively small or not sufficiently strong to be detected by the statistical test employed. Theoretically, the use of audio-visual media in learning has a strong foundation. Previous studies have shown that individuals learn more effectively when information is presented through a combination of visual and verbal formats, as this can maximize the functioning of two cognitive channels (dual-channel processing) (Salehi et al., 2025). Another study also explains that visual learning provides better outcomes than traditional learning systems. In elementary and secondary schools, the effect of visual learning on the development of students' higher-order thinking skills is highly significant (Raiyn, 2016). In addition, the use of multimedia can improve conceptual understanding when it is designed according to cognitive principles such as coherence, signaling, and redundancy. Nevertheless, various international studies indicate that the effectiveness of multimedia-based learning media is highly contextual (Mayer & Moreno, 2003). For example, the meta-analysis conducted by Hattie (2009) demonstrated that educational technology has varying effects on learning outcomes, with effect sizes highly dependent on the quality of implementation and the pedagogical strategies employed.



Figure 1. Force Material Created Using Canva

Technology does not automatically improve learning outcomes without appropriate instructional design. A similar view was expressed by Clark (1983), who argued that media do not directly influence learning outcomes but merely serve as tools for delivering information. According to this perspective, teaching methods are the primary factor in determining learning success, rather than the media themselves. This view was further reinforced by Clark (1994), which emphasized that differences in learning outcomes are more strongly influenced by instructional strategies than by the type of media used. Tamim et al. (2011), through a meta-analysis of 40 years of educational technology research, found that the use of technology produced only a small to moderate effect on learning outcomes (effect size of approximately .35). This finding suggests that technology, including animated video media, is not a dominant factor in improving learning outcomes unless it is supported by other factors such as instructional design and student engagement. Another study by Schindler et al. (2017) also demonstrated that student engagement is a key factor in the success of technology-

based learning. Visually appealing digital media do not necessarily guarantee improved learning outcomes if they fail to encourage deep cognitive engagement. Therefore, the use of Canva-assisted animated videos may not yet be sufficiently effective if students merely act as passive recipients of information.

From the implementation perspective, the findings of this study can be explained by several factors. First, the design of the learning media used may not have fully adhered to the principles of multimedia learning, such as reducing cognitive load. If the media are overly complex or contain excessive information, they may instead hinder students' understanding. This is consistent with John Sweller's Cognitive Load Theory, which states that human working memory capacity is limited (Sweller, 1988). Second, the duration of the treatment in this study may not have been sufficiently long to produce a significant impact. Research in the field of educational technology has shown that learning effects often become evident only after media are used consistently over a certain period of time. Third, learner characteristics also influenced the research findings. Differences in prior knowledge, motivation, and readiness to use technology may have led to high variability in learning outcomes. This variation could have masked the treatment effect, resulting in non-significant differences between groups. Fourth, the effectiveness of the conventional learning methods used in the control class should not be overlooked. In some contexts, conventional teaching methods delivered by competent teachers are still capable of producing optimal learning outcomes. This explains why the difference between the experimental and control groups was not statistically significant. Therefore, the findings of this study reinforce the view that the use of instructional media, including Canva-assisted audio-visual media, is not the sole factor determining learning success. Its effectiveness is strongly influenced by the quality of instructional design, teaching strategies, student engagement, and the overall learning environment. Consequently, optimization in the use of instructional media, as well as further research with more comprehensive designs, is necessary in order to reveal the true potential of technology-based learning media.

Based on the research findings and discussion presented above, several conclusions can be drawn. First, the use of audio-visual animated video media assisted by the Canva application in teaching the topic of Force to fourth-grade students at SD Kristen Nuruwe did not show a statistically significant effect on students' learning outcomes compared to conventional learning methods. This was evidenced by the Sig. (2-tailed) value of 0.710 obtained from the independent t-test, which was greater than the significance level of .05; therefore, H_0 was accepted and H_1 was rejected. Second, although there was no statistically significant difference, the N-Gain analysis showed a fairly meaningful difference in the level of improvement in learning outcomes between the two classes. The experimental class obtained an average N-Gain score of 0.41, while the control class obtained 0.33, both of which were categorized as moderate. The higher N-Gain score in the experimental class indicates that the Canva-assisted media had a positive descriptive impact on improving students' learning outcomes. Third, based on the distribution of N-Gain categories, the proportion of students in the moderate category in the experimental class (45%) was higher than that in the control class (30%), while the proportion of students in the low category in the experimental class (45%) was lower than that in the control class (60%). This indicates that the improvement in learning outcomes in the experimental class was more evenly distributed. Fourth, overall, it can be concluded that Canva-assisted audio-visual animated video media has strong potential as an alternative instructional medium to improve science learning outcomes in elementary schools, although the limited research duration and sample size also influenced the results obtained. Fifth, external factors such as the learning environment, students' initial motivation, and the availability of technological infrastructure also need to receive attention in future studies. Sixth, these findings strengthen the argument that technology-based media innovations such as Canva are worth considering as part of a more modern and contextual science learning strategy in the 21st century.

Based on the findings of this study, the researcher recommends several points to educational stakeholders. For teachers, it is recommended to integrate Canva-assisted audio-visual animated video media more consistently and continuously in science learning, particularly for topics that are abstract in nature. The use of this media should also be combined with active learning models, such as

cooperative learning or project-based learning, in order to maximize its effectiveness. For schools, support in the form of adequate technological infrastructure, including projectors, stable internet connections, and digital devices, is highly necessary to ensure that technology-based learning innovations can be implemented optimally and sustainably. For education authorities, it is necessary to provide structured training programs for elementary school teachers in the use of digital design applications such as Canva, so that the quality of instructional media produced by teachers can be significantly improved.

For future researchers who wish to investigate a similar topic, it is recommended to: (1) extend the duration of the study with a greater number of meetings so that the effects of the media can be observed more clearly in statistical terms; (2) increase the number of research samples to improve the generalizability of the findings; (3) combine the use of Canva-assisted media with more varied learning models, such as Problem-Based Learning or Project-Based Learning; (4) measure other variables that may mediate the influence of the media on learning outcomes, such as learning motivation, students' learning styles, and digital literacy skills; and (5) develop similar studies in other subjects or at different grade levels in order to broaden the scope of research on the effectiveness of Canva-assisted audio-visual media within the context of elementary education in Indonesia.

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Ethics and Conflict of Interest

The authors declare that they have adhered to ethical principles throughout the research process. The authors declare that this study is original, has not been previously published or submitted for evaluation elsewhere, and that all authors have approved the final version of the study. The research was conducted in accordance with ethical principles, and there are no conflicts of interest among the authors.

Data Availability

The data that support the findings of this study are available on request from the author.

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