ETDC Indonesian Journal of Research and Educational Review
Volume 4, No. 4, 2025, pp 1075 - 1089
e–ISSN 2809-3682
p–ISSN 2809-7505

https://doi.org/10.51574/ijrer.v4i4.3680

The Effectiveness of 2D Animation Videos on Disaster Mitigation: Students Elementary Schools' Knowledge of Flood Preparedness

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Article Info

Article history:

Received June 10, 2025
Revised August 12, 2025
Accepted August 21, 2025

Keywords:

Disaster Mitigation;
Elementary School Students;
Floods Preparedness;
2D Animation;
Video.

ABSTRACT

This study examines the effectiveness of 2D animation media on students' knowledge of flood disaster mitigation. The research design is a quasi-experimental study. The study population consists of 64 fifth-grade students at several public elementary schools in Daleman. The sampling technique used was total sampling. Class V-A of Daleman State Elementary School served as the control class, while Class V-B served as the experimental class. Data collection techniques included tests (pre-test and post-test) and non-test techniques such as observation, interviews, and documentation. Initial data analysis techniques included normality tests, while final data analysis involved t-tests and N-Gain. The research results indicate that there is a significant difference between the learning outcomes of students in the experimental class and the control class. The findings of the study indicated that the t-test results, a significance value of sig. = 0.000 (sig. < 0.05), were obtained, thus rejecting H_0 and accepting H_a. This indicates that 2D animation media has a significant effect on improving students' knowledge of flood disaster preparedness. The N-Gain analysis results support these findings, with an average increase in learning outcomes in the experimental class of 0.6047 (moderate category), while the control class only reached 0.3034 (low category). These findings confirm that 2D animated video media can create a more meaningful learning experience and significantly improve students' conceptual understanding. This study suggests that technology-based learning innovations should be utilised more widely to improve learning quality, particularly in instruction on disaster mitigation for elementary schools.

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1. INTRODUCTION

Indonesia's territory is composed of complex geological structures and locations, making it prone to natural disasters. Indonesians have experienced various types of disasters, the most common being flooding (Amri et al., 2017). A disaster is defined as an event or series of events that threaten and disrupt people's lives and livelihoods, caused by natural, non-natural, or human factors, resulting in loss of life, environmental

damage, property loss, and psychological impacts (Chaudhary & Piracha, 2021; Irawati & Supriatnaningsih, 2021). Two cities in Indonesia frequently experience flooding: Jakarta and Semarang. This flooding is due to significant annual land subsidence and other factors such as high sea tides (Permanahadi & Widowati, 2022).

Daleman Public Elementary School is located in Sayung District, Demak Regency. Tidal flooding frequently affects this coastal elementary school. Interviews with teachers at Daleman Public Elementary School have seen tidal flooding over the past two years. 2023 was the highest tidal flooding Daleman Public Elementary School has ever experienced. Early that year, Daleman Public Elementary School experienced its first high tidal flood, with floodwater reaching 50-60 cm in height. Tidal flooding continues to occur at Daleman Public Elementary School. Consequently, lower grades, such as grades 1, 2, and 3, were temporarily closed to allow school conditions to return to normal. The highest tidal flood severely damaged school assets, including teaching materials, at Daleman Public Elementary School, leaving only a few unusable ones. The mitigation measures that have been carried out by the school include turning off the electricity, saving school assets such as books by raising them to higher places and water pumps, and moving upper-class students to higher classrooms so that the teaching and learning process can run smoothly.

A preliminary study with observations and teacher interviews, students lacked understanding of the risks of tidal flooding and lacked knowledge about mitigation measures during high tides. Teachers provided examples of actions, including verbal instructions, to avoid when tidal flooding inundates the school area. Despite several efforts to implement disaster mitigation education, some students lacked understanding and lacked knowledge about disaster preparedness, a common occurrence in their area, namely tidal flooding. In response to this problem, researchers sought to provide a solution by implementing video media in learning. This video media application is one solution, as it clearly visualizes steps for tidal disaster mitigation, from early warning signs to quick and appropriate action when a disaster occurs.

Disaster preparedness aims to minimize the negative impacts of a disaster (Krichen et al., 2024). Preparedness encompasses various aspects, including knowledge, skills, and the need for a responsive attitude to respond effectively and appropriately to disaster situations. Given that children are the most vulnerable group to the impacts of disasters due to minimal exposure to disaster preparedness education, schools must provide this education from an early age (Nurani et al., 2022). Learning methods such as interactive and engaging audiovisual videos, including animated ones, can instill preparedness in children (Saparwati & Trimawati, 2020). Furthermore, schools, where students spend most of their time under teacher supervision, are ideal settings for instilling disaster awareness. Therefore, we need to enhance students' understanding of disaster preparedness, which includes tidal flooding. Teachers at Daleman Public Elementary School have used educational videos and interactive learning methods, such as Q&A sessions and quizzes based on the video material. However, they have never shown an animated video about tidal flooding.

Learning using instructional media is the solution chosen by the researchers. The selected media is audiovisual, with 2D animated videos as the learning medium. 2D video media is an example of the use of technology in learning, making it easier for teachers to deliver material in an interesting way so that students can easily understand it (Stadlinger et al., 2021; Kotimah, 2024). One example of this aspect can be called the use of media for teaching and learning activities in the classroom. Media are tools, procedures, and methods used to enable communication and interaction between teachers and students in learning activities at school (Alzubaidi et al., 2023). Thus, learning media are tools that present educational material, helping teachers assess the success and understanding of teaching and learning activities in education.

The use of video as a learning medium not only increases students' interest and understanding of the material but also encourages active engagement in the learning process (Barut Tugtekin & Dursun, 2022). Video media can facilitate effective learning because students observe and listen to the information presented in the video (Prabowo & Wakhudin, 2024). Video, as an interactive learning medium, can provide students with a more engaging learning experience. The use of video can provide more complex information, such as making geographic concepts more precise with clear visualizations (Walsh et al., 2021). Furthermore, by incorporating local content into the video, students will more easily connect the concepts learned to their surroundings, making the learning process more meaningful and applicable.

This research will implement learning using 2D animated videos for fifth-grade elementary school students. The selection of 2D animated videos was based on their suitability for the students' educational level. Animation is a visual that combines various elements such as text, graphics, images, and audio. These elements produce the effect of movement. Animated videos, on the other hand, are a series of still images combined using interlacing techniques, creating the appearance of movement. Animation is the manipulation of images into moving images (Hasanah et al., 2023). Learning using animated videos offers students the opportunity to actively and effectively participate in it (Galatsopoulou et al., 2022).

Previous research has shown that the use of 2D animated videos is an effective alternative learning medium for increasing student engagement and learning outcomes (Fadloil & Sismulyasih, 2024). Learning with 2D animated videos is a learning tool that can replace conventional modules or teaching materials, making them more effective and engaging, reducing boredom in learning, and enhancing student knowledge (Novianti et al., 2023). This finding is supported by research by Saputro and Winanto (2024), which discusses the use of video-related games, as well as student learning outcomes. Her research demonstrated that these media effectively develop student skills and improve learning outcomes. A similar finding is also supported by research conducted by Wijayanti et al. (2020), which showed that students' knowledge about disaster preparedness increased by 3.1% after using animated disaster preparedness videos.

The effectiveness of using video as a learning medium is further strengthened by previous research findings, which demonstrate that video can convey material in a more

engaging and interactive manner for students. This research is also supported by several relevant previous studies, such as those by Nurani et al. (2022), whose study examined the use of digital video learning media, the development of programs for flood disaster mitigation, and the implementation of disaster mitigation through learning videos. Their research findings demonstrated that digital video media is effective as a learning resource for young children to learn about flood disaster mitigation. Another study by Sama and Fransisco (2022) discussed the design and development of video learning media and its implementation in geography lessons. Videos can enhance students' understanding of concepts by presenting learning materials in a more engaging and accessible manner.

We create animated videos by taking into account the characteristics and needs of elementary school students, especially fifth graders, to tailor them to their cognitive developmental levels. According to Sae and Radia (2023), they are effective in fostering critical thinking and communication skills in students, making the learning material easier to understand. This medium is very useful for improving students' preparedness knowledge, especially in disaster-prone areas, such as coastal areas, because it can present complex concepts visually and engagingly. The main focus of this research is a learning medium using animated videos designed to be age-appropriate for elementary school children, particularly fifth graders. The material will cover tidal flood mitigation, presented using simple language and supporting illustrations for an engaging and easy-to-understand approach. It is hoped that students will be able to recognize the signs of a disaster, take action when it occurs, and appropriately and rapidly mitigate and evacuate.

Building upon the above background, this research will focus on the use of animated disaster mitigation videos as a learning medium to improve tidal flood preparedness knowledge among fifth-grade elementary school students at Daleman Public Elementary School. The research location is in a coastal area with a high tidal flood disaster risk. This study will assess the effectiveness of animated disaster mitigation videos in improving students' preparedness knowledge.

2. METHOD

This research used a quantitative approach. The research method used was quasi-experimental, a quasi-experimental design known as a pretest-posttest control group design. The research was conducted at Daleman Public Elementary School, Gemulak Village, Sayung District, and Demak Regency. The research began in the second semester of the 2024/2025 academic year, namely in June 2025. The following is a pretest-posttest control group design presented in Figure 1.

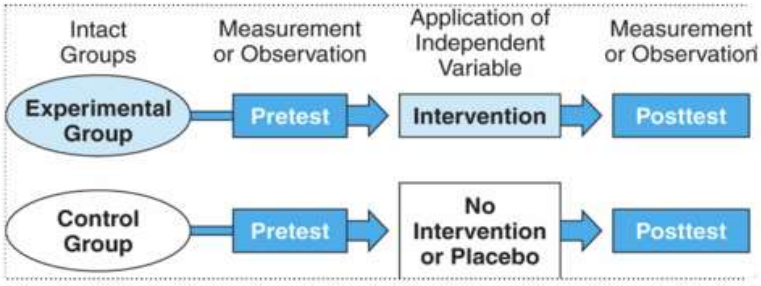

Figure 1. Pretest-Posttest Control Group Design

The research population was all fifth-grade students at Daleman Public Elementary School. This population consisted of two classes, with a total of 64 fifth-grade students. The sampling technique used in this study was total sampling. This technique was used because the population size was relatively small (<100), so the entire population was sampled. The research sample consisted of two intact class groups: class V-A, designated as the control group, and class V-B, which served as the experimental group. The selection of class V-A as the control group was based on a recommendation from the teacher, who has a profound understanding of the characteristics and dynamics of these classes. Meanwhile, the designation of class V-B as the experimental group was based on the availability of sufficient time for the research. Class V-A, consisting of 32 students, received treatment as a control class, while class V-B, also consisting of 32 students, served as an experimental class for comparison purposes.

The data collection technique in this study was conducted in three stages: (1) the preparation stage, including field studies consisting of school observations and interviews; (2) the implementation stage, including the implementation of the research beginning with a pre-test; and (3) the evaluation stage, including the administration of a post-test to determine whether there was an effect of 2D video media on the level of tidal flood preparedness skills in flood mitigation material. The experimental design used was a pre-test-post-test control group design. The hypothesis in this study is that the 2D animation video for disaster mitigation is ineffective on knowledge of tidal flood preparedness and mitigation at Daleman State Elementary School (H0). The 2D animation video for Disaster Mitigation is effective on knowledge of tidal flood preparedness and mitigation at Daleman State Elementary School (Ha).

To collect data, testing techniques (pre- and post-testing) that have been evaluated for validity and reliability, observation, and documentation in the learning process are used to enrich the description. We use tests to measure students' preparedness abilities. The test questions are in the form of open-ended questions totaling 30 items. Data collection in this study was carried out at the pre-research and research process stages. In the pre-research stage, data was collected through interviews and observations related to the learning process. Data collection techniques during the experimental research process include pre-tests (before treatment) and post-tests (after treatment).

The researcher used techniques for testing data validity in this study. The first step in the data analysis technique was to conduct a normality test to determine whether the population was normally distributed. The second step used an independent samples t-

test to evaluate significant differences in post-test results between the experimental and control groups. Data analysis was conducted using SPSS version 25. After testing, the central tendency of the post-test scores was analyzed. Differences in post-test scores were identified if the experimental group outperformed the control group. An independent samples t-test was used to examine the significance column to determine whether this difference was statistically significant. The two-tailed significance value of the independent samples t-test plays a crucial role in this analysis. If the sign. (2-tailed) is below 0.05, the result indicates a statistically significant difference between the post-test results of the two groups. However, if the sign. (2-tailed) exceeds 0.05, the difference is not statistically significant.

The N-Gain test was used to measure the effectiveness of the animated video produced using SPSS version 25. This test was conducted by calculating the difference in pre-test scores between the control and experimental classes and then comparing them. The initial and final test scores were normalized by calculating each participant's initial and final score and then converting them to a uniform scale for more accurate comparisons between individuals. After normalization, N-gain was calculated to measure the improvement between the initial and subsequent test scores. Three categories can be used to determine the achievement category after the N-gain score is obtained: low ($G < 0.3$), moderate ($0.3 < G < 0.7$), and high ($G > 0.7$). Based on the percentage, product effectiveness can be divided into four N-gain levels: ineffective if $G < 40\%$, less effective if $40\% < G < 55\%$, quite successful if $56\% < G < 75\%$, and effective if $G > 76\%$ (Azriati et al., 2021).

3. RESULTS AND DISCUSSION

Results

The description of the data used in this study is the independent variable, namely the application of the 2D Disaster Mitigation animation video, and the dependent variable, namely Rob Flood Preparedness Knowledge. This variable is the main indicator measured to see the effectiveness of the application of the 2D Disaster Mitigation animation video on Flood Disaster Mitigation material. The increase in flood disaster preparedness knowledge is measured through a comparison of the results of the pre-test and post-test given to fifth-grade students of Daleman State Elementary School. Before implementing the learning intervention, the pretest serves as an initial benchmark for students' abilities in flood disaster mitigation. Meanwhile, the post-test is given after students have participated in learning with the implementation of the 2D Disaster Mitigation animation video. The comparison of these two test results is key data to evaluate whether there is a significant increase in understanding and knowledge about flood disaster mitigation preparedness after the learning intervention. This study examines and evaluates how effectively a learning paradigm using 2D animated videos improves knowledge of tidal flood mitigation preparedness in fifth-grade students. By observing pre-test and post-test results, this study explicitly aims to determine whether

there are substantial differences in students' preparedness for tidal flood mitigation, as seen from their results before and after the intervention.

The practical implementation of 2D animated videos for disaster mitigation in flood preparedness enhances students' knowledge while providing meaningful learning experiences. Video media can facilitate effective learning, as students observe and listen to the information contained in the video. Video, as an interactive learning medium, can provide students with a more engaging learning experience. In this study, the test consisted of 40 multiple-choice questions used to assess pre- and post-test results. A summary of student learning outcomes is presented in Table 1 below.

Table 1. Student Learning Outcomes (Pre-Test and Post-Test)

Class	Pre-test		Post-test	
	Control	Experiment	Control	Experiment
Mean	45.03	51.96	61.90	79.34
Score Max	80	83	90	100
Score Min	17	13	37	43

The experimental class using 2D animated video media had an average pre-test score of 51.96, as shown in Table 1. In contrast, the control class' average pre-test score was 45.03. The control group used traditional learning methods instead of 2D animated video media. After the treatment, the experimental class had an average achievement score of 79.34, while the control group scored 61.90. Based on these results, the experimental class outperformed the control group in terms of the results obtained. The highest improvement occurred at the reasoning level because the 2D animated video media ensured that students understood the core concepts and connected them to relevant practical contexts in real life. It emphasized the processes of reasoning, analysis, and complex problem-solving, reinforced by interactive and exploratory animation.

A series of statistical calculations were conducted to analyze the effectiveness of the 2D animated video media for disaster mitigation on students' knowledge of tidal flood mitigation preparedness. These calculations include student achievement scores, independent sample t-tests, and N-gain tests. Normality testing is the initial step in examining pre-test and post-test results. Researchers use parametric tests such as independent sample t-tests to identify normal distributions. The analysis will be conducted using SPSS 25, with a significance level set at >0.05 (Sintia et al., 2022). Table 2 below illustrates the results of the normal distribution test for the experimental and control groups.

Table 2. Normal Test of Pre-Test and Post-Test

	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Preparedness Knowledge	Experimental Pretest	.116	32	.200*	.979	32	.771
	Control Pretest	.152	32	.057	.969	32	.474

Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Experimental Posttest	.151	32	.060	.964	32	.359
Control Posttest	.149	32	.067	.947	32	.115

The results of the normality test of pretest and posttest data in Table 2 show that the pretest significance value for the experimental class was 0.200 and the control class was 0.057, which was tested using the Kolmogorov-Smirnov method. Meanwhile, the pretest significance value using the Shapiro-Wilk method for the experimental class was 0.771, and for the control class, it was 0.474. Then, the posttest significance value for the experimental class was 0.060, and the control class was 0.067, which were tested using the Kolmogorov-Smirnov method. Meanwhile, the posttest significance value using the Shapiro-Wilk method for the experimental class was 0.359, and for the control class, it was 0.115. It can be concluded that the significance value of all pretest and posttest data for both the experimental and control classes exceeds 0.05 in both the Kolmogorov-Smirnov and Shapiro-Wilk methods, so H0 can be accepted, or the pretest and posttest data are normally distributed. The significance values for the pre-test and post-test results for the experimental and control groups were greater than the 0.05 threshold. This result indicates that the data for both groups are normally distributed.

Based on the results of the normality test, which is a prerequisite, it can be concluded that the data in this study are normal. Therefore, the hypothesis can be tested using an independent sample t-test. The following are the results of the independent sample t-test in Table 3.

Table 3. Independent Sample T-Test Results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval; of the Difference	
									Lower	Upper
Results	Equal variances assumed	1.803	.184	-5.539	62	0.000	-17.437	3.148	-23.730	-11.145
	Equal variances not assumed			-5.539	59.970	0.000	-17.437	3.148	-23.734	-11.141

The independent sample t-test results table in Table 3, the sig. (2-tailed) value is 0.000, or less than 0.05. This means the t-value is significant (0.000 < 0.05). Therefore, it can be concluded that H0 is rejected and Ha is accepted. The result means there is a significant difference in average learning outcomes between students in the class treated

with the 2D Disaster Mitigation animation video and students in the class not treated with animation video. Therefore, it can be concluded that the 2D Disaster Mitigation animation video is effective in improving flood mitigation preparedness knowledge for students, who are at the concrete operational stage. By emphasizing in-depth understanding and conceptual connections, students are encouraged to actively explore and relate disaster mitigation material from the animated visual video to real-life experiences. 2D animated videos support this process by presenting material interactively, facilitating understanding of basic concepts (knowing), application in everyday contexts (applying), and the development of reasoning and problem-solving skills (reasoning). This combination of approaches and media pedagogically and cognitively encourages students to build understanding gradually and comprehensively, making learning more meaningful, engaging, and appropriate to the learning needs of elementary school students. The N-Gain test was conducted to analyze changes in the experimental class scores. This difference indicates the estimated development of the experimental group's skills and knowledge related to preparedness for tidal flood disasters. The N-Gain values are shown in the following Table 4.

Table 4. N-Gain Learning Score of Experimental Class

	Class			Statistic	Std. Error
N-gain Percent	Experiment	Mean		60.47	3.437
		95% Confidence Interval for Mean	Lower Bound	53.46	
			Upper Bound	67.48	
		5% Trimmed Mean		59.79	
		Median		63.91	
		Variance		378.097	
		Std. Deviation		19.445	
		Minimum		32	
		Maximum		100	
		Range		68	
		Interquartile Range		30	
		Skewness		.388	.414
		Kurtosis		-.683	.809
		N-Gain		0.6047	
	Kontrol	Mean		30.34	2.301
		95% Confidence Interval for Mean	Lower Bound	25.65	
			Upper Bound	35.03	
		5% Trimmed Mean		30.73	
		Median		29.82	
		Variance		169.395	
		Std. Deviation		13.015	
		Minimum		0	
		Maximum		55	
		Range		55	
		Interquartile Range		15	
		Skewness		-.350	.414
		Kurtosis		.500	.809
		N-Gain		0.3034	

Table 5. N-gain Interpretation Categories

N-Gain Value	Category
N-gain>0.7	High
0.3< n-gain <0.7	Medium
N-gain <0.3	Low

Table 5's N-Gain test results reveal that the initial abilities of both research classes were nearly identical. However, after being given different treatments, the two research classes had different average increases (N-Gain) in results. The experimental class's N-Gain value, at 0.6047, falls into the moderate category. Meanwhile, in the control class, the N-Gain value was 0.3034, which is included in the moderate category. Meanwhile, based on the effectiveness classification, the control class was included in the ineffective category, and the experimental class was included in the quite effective category. This indicates that fifth grade students at Daleman State Elementary School who received learning treatment with 2D animation videos for disaster mitigation experienced a greater average increase (N-Gain) in their knowledge of tidal flood disaster preparedness compared to those who did not receive this treatment.

Discussion

This study confirmed the hypothesis that the use of a 2D animated video on disaster mitigation significantly improved knowledge of tidal flood mitigation preparedness among fifth-grade students at Daleman Public Elementary School. The striking difference between the experimental and control classes, both in terms of the average post-test and the N-Gain score, confirmed the superiority of this medium compared to learning without animated videos. The success of this animated video is due to its ability to present complex material such as tidal flood mitigation in a visual, interactive, and easily digestible format. Students at the concrete operational stage, such as fifth-grade students, benefit greatly from concrete, visual-based learning. Interactive and exploratory animations enable students to become more than passive recipients of information and also actively participate in constructing their own understanding. This aligns with the principle that engaging media can stimulate students' enthusiasm for learning, as the presentation of material extends beyond textbooks (Chisunum & Nwadiokwu, 2024).

2D animated videos encourage students to go beyond memorization to analysis, link concepts to real-world contexts, and develop problem-solving skills. These are important indicators of quality learning, which goes beyond mere knowledge transfer. The use of 2D animated videos creates a more meaningful and engaging learning process for students (Setyaedhi, 2023). According to Prabowo and Wakhudin (2024), video media helps students observe and absorb information effectively, as interactive visualizations and audio make the material easier to remember and understand

In flood-prone areas, such as Sayung, the use of this media is highly relevant in efforts to improve flood disaster preparedness. By presenting complex material on tidal flood mitigation in a visual and interactive format, this media can significantly

accelerate students' understanding. They will more quickly recognize signs of an impending disaster, know what actions to take when a disaster occurs, and understand proper and rapid evacuation procedures. This is crucial for equipping the younger generation with practical knowledge that can save lives and minimize losses during floods.

Learning using 2D animated video media effectively improves tidal flood preparedness knowledge and flood disaster mitigation material for fifth-grade students at Daleman State Elementary School. This effectiveness is further strengthened by several factors. First, 2D animation videos can make students more active in learning because problem-solving requires appropriate information that students cannot obtain if they are passive in learning, so students are more active in participating in the learning process (Nandifa et al., 2023). The use of 2D animation video media in learning makes students use their critical thinking skills much more in solving problems because the problems used are problems in students' daily lives or in real contexts (Widyasari et al., 2024).

Second, the use of media that integrates technology, such as 2D animation, allows students to understand the material more deeply. This is because 2D animation can visualize the material while simultaneously increasing student engagement in learning (Riskiono et al., 2020; Faiza et al., 2023). Therefore, this media is one of the learning media that can maximize the learning process in the classroom (Widodo, 2016; Prabowo & Wakhudin, 2024).

Third, the use of 2D animation video media is certainly a learning process that aligns with Article 7, paragraph (2) of the Minister of Education, Culture, Research, and Technology Regulation Number 16 of 2022 concerning Process Standards, which states that learning should focus on real-world problems or contexts and integrate technology. This means that the use of student-centered 2D animation video media, coupled with good material visualization and student engagement, can make students more interested in the learning process. As a result, student learning outcomes significantly improved (Ginting & Tambunan, 2023).

The use of 2D animated video significantly improved the quality of disaster mitigation preparedness knowledge in fifth-grade students at Daleman Public Elementary School. Teachers can utilize this media by integrating it into lesson plans and conducting post-screening discussions. It is crucial for teachers to receive specialized training that includes selecting relevant and effective content (Saputra et al., 2025; Purnama et al., 2023). When selecting or developing learning content, teachers must consider the relevance of the material, student characteristics, credible sources, and appropriate duration. By implementing these steps, teachers at Daleman Public Elementary School can create a more engaging and beneficial learning experience for students, thereby strengthening their knowledge of tidal flood preparedness, which has been a frequent and persistent problem.

Based on the results of this study, it can be concluded that statistically the knowledge of disaster preparedness of students in the experimental class is higher compared to the control class, which means that the learning process using 2D animation videos for

disaster mitigation is declared very effective because there is a very significant difference in results between the experimental class and the control class, so it can be generalized to a larger population. However, this study still has several limitations, including the small number of samples, the short duration of the study, and the lack of control over confounding variables, which can affect the validity of the results. For further research, it is recommended that researchers use a larger sample, extend the duration of the study, and control confounding variables by designing a more rigorous experiment. In addition, exploration of variations in media and learning methods as well as qualitative studies of student experiences can help deepen understanding of the effectiveness of 2D Disaster Mitigation animation video media in Flood Disaster Mitigation material so that it can make a greater contribution to educational practice, especially in elementary schools.

4. CONCLUSION

Building upon the results and discussions that have been carried out in this study, it can be concluded that 2D animated videos are effective and have a higher average increase (N-Gain) compared to not using 2D animated videos on knowledge of tidal flood disaster preparedness in disaster mitigation material for grade V public elementary school Daleman. The application of 2D animated videos has a positive and significant effect on increasing knowledge of tidal flood disaster preparedness. The learning process has encouraged students to think critically through a series of activities using 2D animated videos. This makes students more active in learning. 2D animation videos encourage students to not only memorize but also analyze, relate concepts to real contexts, and develop problem-solving skills. The use of 2D animation videos creates a more meaningful and engaging learning process for students.

As a suggestion, 2D animation videos can be applied in disaster mitigation learning to improve elementary school students' knowledge of flood preparedness. Teachers can also participate in training to learn how to develop and apply 2D animation videos in disaster mitigation learning. Further research can be conducted to develop 3D animation videos for disaster mitigation and compare their effectiveness with 2D animation videos. Furthermore, further research can be conducted to develop more effective knowledge measurement tools to measure students' knowledge levels about disaster mitigation.

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