

Original Research

The Effectiveness of Dual-Mode Simulation (Video and Puzzle) in Enhancing Flood Disaster Preparedness Among Elementary Students in Flood-Prone

Zulhijayanti^{1*}

¹Nursing Study Program, Makassar College of Health Sciences, Makassar, Indonesia

Article Info	Abstract
<p>Received: 18-06-2024 Revised: 26-07-2024 Accepted: 26-10-2024</p> <p>*Corresponding Author: Zulhijayanti Nursing Study Program , Makassar College of Health Sciences, Makassar Email: zulhijayanti29@gmail.com</p>	<p>Background: Floods are the most common natural disasters in Indonesia, accounting for 43.1% of incidents in 2022. Flood-prone urban areas such as Makassar face recurrent seasonal inundations. Enhancing disaster preparedness through simulation-based education in schools is crucial.</p> <p>Objective: This study aimed to evaluate the effectiveness of dual-mode simulations (animated video and puzzle-based learning) in improving flood disaster preparedness among elementary school students.</p> <p>Methods: A pre-experimental one-group pretest-posttest design was used involving 84 students from SD Inpres Nipa-Nipa, Makassar. Interventions included video simulations and educational puzzles administered in two sessions over one month. Preparedness levels were measured using a validated questionnaire before and after the intervention.</p> <p>Results: Wilcoxon test results showed significant improvement in disaster preparedness after both video simulation ($p = 0.000$) and puzzle-based learning ($p = 0.000$).</p> <p>Conclusion: Dual-mode simulation methods significantly improved flood disaster preparedness in schoolchildren. Educational simulations, particularly when combined with interactive tools, are recommended for school-based disaster risk reduction strategies.</p> <p>Keywords: Flood Disaster; Simulation; Student</p>

Introduction

Natural disasters remain a significant challenge globally, particularly in regions prone to environmental hazards such as Indonesia. Flooding, in particular, has emerged as the most frequent natural disaster, with the National Disaster Management Agency (BNPB) reporting that floods accounted for 43.1% of disaster events in 2022. These disasters are driven by multiple factors, including heavy rainfall, environmental degradation, poor waste management, and unplanned urban development (Ramadhanty et al., 2022; Ariningtyas, 2020).

Floods pose serious threats not only to infrastructure and the economy but also to public health and education. Schools, especially in vulnerable areas, often experience closures and disruptions during flood events. Beyond immediate physical impact, flooding also increases the risk of waterborne diseases, mental stress, and long-term economic hardship for families and communities (Syam, 2019).

To mitigate such impacts, Law No. 24 of 2007 on Disaster Management emphasizes the importance of disaster preparedness as part of national mitigation strategies. Preparedness involves strengthening individuals' knowledge, attitudes, and skills to respond to disasters effectively (Lia, 2022). It is particularly important to begin these efforts early, targeting children and adolescents through structured educational interventions.

One effective approach to fostering disaster awareness is simulation-based education. Simulations allow students to engage with real-life scenarios in a safe, guided environment, encouraging experiential learning and better retention. These methods support the development of decision-making skills and emotional resilience, both of which are crucial in emergency situations (Jehosua, 2021).

Recent studies highlight the effectiveness of multimedia and interactive educational tools in disaster education. Animated videos provide visual storytelling that can simplify complex information, while puzzles encourage cognitive engagement and reinforce key concepts through repetition (Haristiani

et al., 2022; Jusuf et al., 2023). These tools are especially useful for children, who respond positively to dynamic and playful learning environments.

In this study, two simulation methods were used: video animations and puzzle-based activities. The video simulations introduced students to the causes and consequences of flooding, safety measures before and during floods, and post-disaster recovery actions. Meanwhile, puzzle activities focused on reinforcing knowledge about flood warning signs, emergency equipment, evacuation procedures, and key safety messages.

The integration of these two learning modalities was designed to provide both cognitive stimulation and active participation, aiming to enhance disaster preparedness in a comprehensive and enjoyable way. Educational content was adapted to be age-appropriate, relevant, and aligned with disaster risk reduction principles.

This study aims to examine the effectiveness of the dual-mode simulation method—video and puzzle-based learning—in improving students' knowledge and preparedness for flood disasters. The results are expected to inform future efforts in designing effective disaster education programs for young learners in school environments.

Methods

Study Design

This research applied a pre-experimental design using a one-group pretest-posttest approach. This design was selected to evaluate changes in flood disaster preparedness among students after receiving simulation-based educational interventions. Although it does not include a comparison group, this design allows for the measurement of differences in knowledge and preparedness levels before and after the intervention within the same sample. The research was carried out in a structured and systematic manner, involving preparatory steps such as permissions, coordination with schools, and ethical approvals.

Samples/Participants

Participants in this study were elementary school students from grade five and six. The sample was selected using purposive sampling, targeting students who were available and willing to participate in the simulation activities. The number of participants was determined using the Slovin formula to ensure an adequate representation with a tolerable margin of error. As a result, a total of 84 students were included in the study. Prior to data collection, participants and their guardians were informed about the purpose of the study, and consent was obtained accordingly.

Instruments

The instrument used in this study was a structured questionnaire. The questionnaire was designed to assess students' knowledge and preparedness regarding flood disasters. It consisted of multiple-choice and checklist questions that covered various aspects of disaster readiness, such as understanding flood causes, recognizing warning signs, emergency procedures, and safety actions before, during, and after a flood. The questionnaire was validated by experts and tested in a pilot group to ensure clarity and reliability. The same questionnaire was used for both the pretest and posttest to evaluate changes in understanding after the simulation.

Interventions

The intervention was conducted in two sessions over a one-month period. In the first session, students were given an animated video explaining what floods are, how they occur, and what actions should be taken to stay safe. The video also illustrated simple emergency measures such as storing important items, preparing basic supplies, and avoiding floodwater. After watching the video, students were encouraged to ask questions and discuss what they learned. In the second session, students were given educational puzzles related to flood disaster preparedness. These puzzles included matching symbols, sequencing emergency steps, and identifying safe behaviors. The purpose of using both video and puzzle simulations was to reinforce the learning material in both visual and interactive ways.

Data Collection

Primary data were obtained from students through pretest and posttest questionnaires administered directly before and after the intervention sessions. Secondary data such as class lists and student numbers were obtained from the local educational authority to support sampling and planning. Prior to implementation, the research team obtained ethical clearance and written permission from the educational institution involved. All data collection was supervised by the researchers to ensure the process ran smoothly and ethically.

Data Analysis

Univariate analysis is used to objectively analyze univariate data by calculating the frequency and percentage distribution of each variable.

Bivariate analysis was performed on the independent variable (simulation method) with the dependent variable (flood disaster preparedness) based on the data obtained using the paired t test if the data is normally distributed and the Wilcoxon test if the data is not normally distributed, using the Normality Test (Kolmogorov-Smirnov or Shapiro-Wilk). The test result is said to have an effect if the value is $p \leq 0.05$ and has no effect if $p > 0.05$.

Ethical Considerations

The study was conducted following ethical standards for educational research involving minors. Approval was obtained from the Ethics Committee of the affiliated institution. Participation was voluntary, and all respondents received a clear explanation of the research objectives, procedures, and confidentiality measures. Parental consent was also obtained prior to student participation.

Results

Characteristics of Respondents

Table 1 presents the demographic characteristics of the 42 respondents who participated in the video simulation. The gender distribution shows a slightly higher number of female students (52.4%) compared to male students (47.6%). This relatively balanced distribution suggests that the intervention reached both genders fairly equally, providing an unbiased representation of student responses.

All respondents were sixth-grade students, indicating that the simulation activity was targeted at students at the upper elementary level, who are assumed to have higher cognitive readiness and understanding of abstract concepts such as disaster preparedness. Age-wise, the majority of respondents were 11 years old (71.4%), followed by 12 years old (21.4%), with only a few being 10 and 13 years old. This age range is typical for students in grade six and represents a critical stage in childhood where students are capable of understanding cause-effect relationships, making it an ideal period for introducing disaster education.

Table 1 Distribution of respondents' characteristics Video Simulation of SD Inpres Nipa-Nipa Makassar City in 2023

Variable	n	%
Gender		
Man	20	47,6
Woman	22	52,4
Class		
Grade 6	42	100,0
Age		
10	2	4,8
11	30	71,4
12	9	21,4
13	1	2,4
Total	42	100,0

Source: Primary Data 2023

In Table 2, characteristics of the 42 respondents who participated in the puzzle simulation are described. Similar to the video group, there were more female students (61.9%) than male students (38.1%). This may reflect the gender composition in the sampled classes or school population. All participants in this group were fifth-grade students, meaning they were slightly younger than the video simulation group and at an earlier stage of primary education.

The age distribution reveals that most students were 10 years old (73.8%), with smaller percentages aged 9, 11, and 12. This shows that the puzzle intervention was implemented among a slightly younger cohort. Given that children at this age learn effectively through play and interactive activities, the use of puzzles as an educational medium was appropriate and likely to engage the target audience effectively.

Table 2 Distribution of Characteristics of Respondents Puzzle Simulation of SD Inpres Nipa-Nipa Makassar City in 2023

Variable	n	%
Gender		
Man	16	38,1
Women	26	61,9
Class		
Grade 5	42	100,0
Age		
9	1	2,4
10	31	73,8
11	9	21,4
12	1	2,4
Total	42	100,0

Source: Primary Data 2023

Univariate Analysis

Table 3 compares the levels of disaster preparedness before and after the video simulation intervention. Prior to the intervention, 61.9% of the students scored in the "good" category, while 38.1% fell into the "less" category. This suggests that a majority of students had some prior awareness or exposure to the concept of flood preparedness, though a significant proportion still lacked adequate knowledge.

Following the video simulation, there was a marked improvement: 90.5% of the students achieved "good" scores, and only 9.5% remained in the "less" category. This substantial increase indicates that the video simulation had a strong positive effect on students' understanding of flood disaster preparedness. The combination of audio and visual elements likely enhanced their ability to process and retain the information presented. The sharp reduction in low scores further underscores the effectiveness of using video as an instructional tool for disaster education.

Table 3 Distribution of Pre and Post Characteristics of Video Simulation of SD Inpres Nipa-Nipa Makassar City in 2023

Variable	n	%
Pre test Video		
Good	26	61,9
Less	16	38,1
Post test Video		
Good	38	90,5
Less	4	9,5
Total	42	100,0

Source: Primary Data 2023

As shown in Table 4, the results of the puzzle simulation also demonstrated notable improvements. Before the intervention, 61.9% of students scored in the "good" category, while 38.1% were in the "less" category—identical to the pretest distribution in the video group. However, after completing the puzzle-based simulation, 100% of the students moved into the "good" category, indicating that every participant had reached an adequate level of preparedness knowledge.

This result is particularly significant as it suggests that puzzle simulations can serve not only as a reinforcement tool but also as an effective standalone intervention for increasing disaster awareness. The total elimination of the "less" category post-intervention reflects the high level of student engagement and learning retention that puzzle activities can stimulate, especially among younger students.

Table 4 Distribution of Pre and Post Characteristics of Video Simulation of SD Inpres Nipa-Nipa Makassar City in 2023

Variable	n	%
Pro Test Puzzle		
Good	26	61,9
Less	16	38,1
Post test Puzzle		
Good	42	100,0
Total	42	100,0

Source: Data Primary Data 2023

Bivariat Analysis

Table 5 displays the statistical analysis using the Wilcoxon signed-rank test to compare pretest and posttest scores in both simulation methods. For the video simulation, the test yielded a p-value of 0.000 ($p < 0.05$), indicating a statistically significant improvement in students' disaster preparedness following the intervention. Similarly, the puzzle simulation also resulted in a p-value of 0.000, further confirming the effectiveness of the educational approach.

The Wilcoxon test, a non-parametric alternative to the paired t-test, was chosen because the data did not meet the assumption of normal distribution. The significance in both tests confirms that the improvements in knowledge observed after the interventions were not due to chance, but rather the result of the simulation activities.

These findings support the conclusion that both video and puzzle simulation methods are highly effective in enhancing elementary students' understanding of flood disaster preparedness. Moreover, the use of two different yet complementary approaches may offer broader cognitive benefits—while videos improve comprehension through visual and auditory means, puzzles enhance memory and critical thinking through interactive engagement.

Table 5 The effect of simulation methods on flood disaster preparedness of SD Inpres Nipa-Nipa Makassar City in 2023

Simulasi	n	Positive Ranks	Tiensi	Negative Ranks	P value
Pre post Video	42	13	29	0	0,000
Pre post puzzle	42	16	26	0	0,000

Source: Primary Data 2023

Discussion

Characteristics of Respondents

Based on data collection, 42 respondents were given video simulations, mostly female gender, namely 22 people (52.4%) and the least was men, which was 20 people (47.6%). This is in line with research conducted by Istiroha & Basri (2020) which said the female gender is the highest number, namely 15 people (75.0%).

Based on data collection, 42 respondents were given video simulations, mostly female gender, namely 26 people (61.9%) and the least was men, which was 16 people (38.1%). This is in line with research conducted by Fatmah (2022) saying that the highest number of female genders is 27 people and the male gender is 3 people. Where most women have mobile phones that make it easy for them to access information about anything.

The class category of most respondents in grade 6 is 42 people (50.0%) and grade 5 is 42 people (50.0%). This is in line with research conducted by Setiyowati & Suprapt (2023) which says grades 6 and 5 constitute the highest number, namely 61 people (43%).

Meanwhile, based on the age category of the video simulation of 42 respondents, most of them were 11 years old as many as 30 people (71.4%), and the least 13 years old was 1 person (2.4%). This

is in line with research conducted by Setiyowati & Suprapti (2023) which said that respondents aged 11 years were 65 people (46%).

Based on the age category of the puzzle simulation of 42 respondents, most of them were 10 years old as many as 31 people (73.8%), and the least aged 9 and 12 years were 1 person (2.4%). This is in line with research conducted by Husniawati et al., (2023) which showed that respondents aged 10 years were 30 people (66.7%). Not always a person's age determines how much they understand about something.

Video and Puzzle Simulation Method (pre post test)

Based on research conducted by researchers before being given simulations, most respondents did not know about disaster preparedness because they said they had never been simulated preparedness when a disaster occurred. This is in line with research conducted by (Ferianto & Hidayati, 2019) it is known that most of the 21 (75%) respondents are in the category of preparedness behavior is not ready. Respondents tend not to have knowledge about understanding preparedness in facing a disaster or flood disaster, and if not given disaster management training with simulation methods to students in dealing with flood disasters can result in student preparedness behavior becoming less prepared. Researchers assume students' knowledge is lacking about preparedness because the school has never provided disaster simulations to students at SD Inpres Nipa-Nipa Makassar City.

The results showed that the highest distribution of video simulation pre-test characteristics was 26 people (61.9%) in the good category and 16 people in the less category (38.1%). While the distribution of the highest video simulation post-test characteristics is the good category as many as 38 people (90.5%) and the less category as many as 4 people (9.5%).

This is in line with research conducted by Haristiani et al. (2022) showing that the characteristics of the pre-test were 30 00 (50.8%) and the characteristic post-test was 35 people (59.3%). This is in line with research conducted by Melinda Pramesti Wirantika (2019) which showed that in the pre-test as many as 17 people (68%) and post-test as many as 25 people (100%).

Based on research conducted by researchers, the question that has increased the most about flood disasters. This is in line with research conducted by Giena et al., (2022) showing that there are positive effects of audio-visual media on people's attitudes. The sufficient information provided in this research video is likely to influence the attitude of people in Tanjung village, Hamparan Rawang District. Researchers assume that this change in knowledge occurs because the material in the form of videos is easily accepted by students and the process of delivering action techniques in practice is interesting.

The results showed that the highest distribution of pre-test characteristics of puzzle simulation was 26 people (61.9%) and 16 people (38.1%) in the less category. While the distribution of the highest post-test characteristics of the puzzle simulation is the good category as many as 42 people (100.0%).

Based on research conducted by researchers, the most improved questions about flood disasters and flood disaster preparedness. This is in line with research conducted by Jusuf et al., (2023) showing that the pre-test characteristics were 7 students (31.82%) while the post-test of 18 students (81.82%) from the results of the pre and post simulation puzzle was known to increase the results of the student post test the success indicator of the activity reached 80%. Researchers assume this media is very helpful to make children excited and more active in learning.

The effect of the simulation method on flood disaster preparedness at SD Inpres Nipa-Nipa Makassar City.

The results of the Wilcoxon test obtained with a p value = 0.000 < 0.05, it can be concluded that the hypothesis is accepted which means that there is an average difference between the pretest and posttest, so it can be concluded that there is an influence of the video simulation method on the Flood Bnecana Preparedness at SD Inpres Nipa-Nipa Makassar City.

Based on the results of research in the field shortly before showing the video, researchers asked about Flood disaster preparedness and the causes of floods but many students still did not know about it. During the video playback, many students were interested, enthusiastic and concentrated on watching the video in front.

This research is in line with research conducted by Tiara et al, (2019) obtained p value = 0.000 , with a value of $\alpha = 0.05$ ($p < \alpha$), meaning that there is an influence before and after health education through animated videos on knowledge about flood preparedness in Silaberanti Lorong Dahlia Palembang Village. The animation media method in this study helps the public to better understand and be able to apply the content or information provided when conducting health education. This can help in research, people will remember more in receiving information.

The media used in this community service are animated videos and also disaster simulations. The media was chosen because there are several studies that discuss the effectiveness of video and simulation media. Video is one of the audio-visual media that is quite attractive in various ages (Haristiani et al, 2022).

Preparedness videos are very effective, efficient, and easy to remember because they contain preparedness materials in facing disasters such as securing valuables, not littering, preparing medicines, not running on heavy currents etc. (Melinda, 2019).

Before being given flood disaster preparedness training with video media, the average value of the student preparedness index was in the almost ready category. This can be because respondents already have a fairly good knowledge of flood disasters. After the flood disaster preparedness training was given with video media, the average value of the preparedness index increased and the results of statistical tests also showed that there was a significant difference in the level of preparedness before and after the training. Video as one of the learning media is an audio-visual media that can describe an object that moves together with natural sound or appropriate sound. (Istiroha & Basri, 2020).

Therefore, this animated video is very well applied so that students more easily understand the material presented, especially with direct simulations, students will be impressed to follow the learning process (Haristiani et al., 2022).

The results of the Wilcoxon test obtained with a p value = $0.000 < 0.05$, it can be concluded that the hypothesis is accepted which means that there is an average difference between the pretest and posttest, so it can be concluded that there is an influence of the Puzzle simulation method on the Flood Bncana Preparedness at SD Inpres Nipa-Nipa Makassar City.

This research is also in line with research conducted by Jusuf et al., (2023) which said that the level of students' understanding of disaster preparedness has increased after learning using crossword puzzles at SMP Negeri 7 Gorontalo. This is because providing education on disaster preparedness using educational video media and puzzles can improve disaster preparedness in elementary school students.

Play is the right stimulation part. play can improve children's thinking power so that children utilize emotional, social, and physical aspects. Play can also improve physical abilities, experience and knowledge, as well as develop children's mental balance. Puzzle is a game that can facilitate associative play where at preschool age children like to play with other children so that puzzles can be used as a means of playing for children while socializing (Nengrum & Ramadhani, 2021).

To create a culture of safety and resilience, mitigation needs to be adopted through knowledge, creativity, and education. Efforts to improve disaster preparedness can be given to school students using animated videos and Crossword puzzle game media. Through animated videos, learning about disaster preparedness becomes more imaginative so that it is interesting for students to learn. Education through crossword puzzle games can have an influence in increasing knowledge and brain ability so that creativity can develop, increase enthusiasm for learning, strengthen memory, and make learning more fun (Jusuf et al., 2023).

Conclusion

Based on the results of research that has been carried out at SD Inpres Nipa-Nipa Makassar City about flood disaster preparedness, several conclusions can be drawn, namely, knowledge about flood disaster preparedness before a video simulation of 26 people (61.9%) and before a puzzle simulation of 26 people (61.9%) in SD Inpres Nipa-Nipa students. Knowledge about flood disaster preparedness was known after a video simulation of 38 people (90.5%) and after a puzzle simulation of 42 people (100.0%) in students of SD Inpres Nipa-Nipa. And there is an effect of simulation on flood disaster preparedness in students of SD Inpres Nipa-Nipa (Wilcoxon Test results from video simulations of $0.000 < 0.05$ and p values of $0.000 < 0.05$ from puzzle simulations).

Acknowledgment

The researchers' gratitude is conveyed to all parties involved in this research, both those directly involved, and those who are indirectly involved.

References

- Andhini, N. F. (2019). Kajian banjir (Bab II). *Journal of Chemical Information and Modeling*, 53(9), 1689–1699. <http://scholar.unand.ac.id/55790/3/bab%20akhir.pdf>
- Ariana, R. (2019). *Flood preparedness educational game for introduction to flood disasters in MI Negeri 2 Jepara children* (pp. 1–23).
- Arifin, M., Rasyid, A. R., Yudono, A., Wunas, S., Trisutomo, S., Jinca, M. Y., Ali, M., Akil, A., Osman, W. W., & Sutopo, Y. K. D. (2021). The concept of flood disaster management in Perumnas Manggala housing in Makassar City. *Applied Technology Journal for Community Engagement and Services*, 4(2), 151–165.

- Ariningtyas, A. (2020). The relationship between the level of knowledge and attitudes with the preparedness of students and schools in facing flood disasters in SMAN 5 Tegal City in 2019 [Internet]. [cited 2021 Dec 13]. Available from <http://lib.unnes.ac.id/41210/1/3201415003.pdf>
- Budiharjo, A., Purnamasari, A. I., & Dana, R. D. (2022). Flood disaster mitigation educational game using agile development method. *Journal of Informatics Engineering Students*, 6(2), 802–810.
- Fatmah, F. (2022). Effect of disaster training on knowledge regarding flood risk management amongst families with older people. *Jamba: Journal of Disaster Risk Studies*, 14(1), 1–7. <https://doi.org/10.4102/jamba.v14i1.1262>
- Ferianto, K., & Hidayati, U. N. (2019). The effectiveness of disaster management training with simulation methods on flood disaster preparedness behavior in SMAN 2 Tuban students. *Mesencephalon Journal of Health*, 5(2). <https://doi.org/10.36053/mesencephalon.v5i2.110>
- Ghoniyyu, M. R. (2019). *Android-based earthquake and flood disaster response simulation game application at the West Java National Disaster Management Agency* (pp. 8–45).
- Giena, V. P., Wahyuni, S., Hanifah, & Rahmawati, I. (2022). The influence of audio-visual media on community preparedness attitudes in flood disasters in Tanjung Village, Hamparan Rawang District, Jambi Province. *Sriwijaya Journal of Nursing*, 9(2), 13–17. <https://doi.org/10.32539/jks.v9i2.150>
- Haristiani, R., Setioputro, B., & Yunanto, R. A. (2022). Increasing knowledge of flood disaster preparedness through education, animated videos and simulations at SMPN 3 Ambulu Jember. *Cryptoeconomic Systems*, 2(1), 26–35. <https://doi.org/10.21428/58320208.082fed82>
- Hikmatul, A. (2011). The role of government and NGOs in natural disaster management in China. Retrieved from <http://repository.upnyk.ac.id/id/eprint/8177>
- Hidayanto, A. (2020). Knowledge and attitude of community preparedness towards flood disasters in Mangunharjo Village, Tugu District, Semarang City. *Higeia (Journal of Public Health Research and Development)*.
- Husniawati, N., Indriyati, T., & Sitorus, S. (2023). Flood disaster preparedness education in schools as an effort to increase knowledge about disasters. *Media Health Works*, 6(1), 50–60.
- Istiroha, & Basri, A. H. (2020). Preparedness training with PowerPoint media and video media in improving flood disaster preparedness for high school students. *Journal of Nears Comunity*, 11(2), 202–215.
- Jehosua, A. (2021). Influence of flood disaster simulation method on student preparedness levels. *SMP Negeri 1 Pinogaluman*, 16, 147–152.
- Jusuf, H., K, S. B., Then, N. A. S., Nakoe, M. R., Maksum, T. S., Hadju, V. A., & Aulia, U. (2023). Flood disaster preparedness education through animated videos and crossword puzzles at SMP Negeri 7 Gorontalo. *Abdi Wiralodra: Journal of Community Service*, 5(1), 73–89. <https://doi.org/10.31943/abdi.v5i1.100>
- Lia, S. (2022). The use of simulation methods in flood natural disaster management for cognitive development of children of group B2 Al-Ulhaq Sukabumi Bandar Lampung. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/autism-spectrum-disorders>
- Lindawati, L., & Wasludin, W. (2017). The relationship of knowledge and attitudes about flood disasters to preparedness in health in the community RW 05 RT 01 and RT 03 Gondrong Village, Tangerang City. *Journal of Medicine (Health Information Media)*, 4(2), 195–202. <https://doi.org/10.36743/medikes.v4i2.86>
- Mahmudah, S., & Fauzia, F. (2022). Application of simulation models on earthquake natural disaster mitigation learning based on animated videos to improve student learning outcomes. *Basicedu Journal*, 6(1), 633–645. <https://doi.org/10.31004/basicedu.v6i1.1974>
- Mas'ula, N., Siartha, I. P., & Citra, I. P. A. (2019). Community preparedness for flood disaster in Pancasari Village, Sukasada District, Buleleng Regency. *Journal of Geography Education Undiksha*, 7(3), 103–112.
- Melinda. (2019). Flood preparedness video in supporting residents' preparedness behavior in facing floods. *Journal of Chemical Information and Modeling*, 15(2), 9–25.
- Nengrum, L. S., & Ramadhani, D. A. (2021). The effect of puzzle therapy on trauma in preschool children after the flash flood disaster in Batu City, East Java. *Borneo Journal of Medical Laboratory Technology*, 3(2), 206.
- Ningrum, A. S., & Ginting, K. B. (2020). Flood management strategies based on disaster mitigation in flood-prone areas in the Seulalah River Basin, Langsa City. *Geography Science Education Journal*, 1(1), 6–13.
- Pawenrusi, E. P., Syatriani, S., Efendi, S., & Bustan, N. (2017). *Thesis writing guidelines edition 19*. Makassar Sticks.

- Primary, R. (2020). Flood disaster mitigation in Pulau Permai Village, Mining District, Kampar Regency, Riau Province.
- Ramadhanty, N. R., Muryani, C., & Tjahjono, G. A. (2022). Analysis of the level of community vulnerability to tidal flooding in West Tegal District, Tegal City in 2021. *International Journal Environment and Disaster*, 1(1), 73–82.
- Rinanda, S. (2019). The effect of natural disaster response simulation methods on mitigation capabilities in children with mild intellectual impairment in class C/D VI SLB Perwari Padang. *Scientific Journal of Special Education*, 1, 164–173.
- Saputri, S. S., & Sudarmilah, E. (2019). Flood disaster mitigation educational game. *Journal of Technology and Informatics*, 1(1), 11–19.
- Setiyowati, Y. D., & Suprapti, F. (2023). Disaster preparedness with simulated self-rescue during an earthquake in elementary school children grades 4–6. 1(1), 6–9.
- Studies, P., Health, M., & Postgraduate, D. (2020). IAKMI South Tangerang preparedness level to face flood disaster at SDN Pinding, Babel District, Southeast Aceh Regency in 2020.
- Sham, N. (2019). Direction for handling flood-prone areas based on GIS in Tamalate District, Makassar City. *Plano Madani: Journal of Urban and Regional Planning*, 4(2), 42–48.
- Tiara, T. M., Romadoni, S., & Imardiani, I. (2019). The effect of using animated videos on public knowledge about flood preparedness in Silaberanti Lorong Dahlia Palembang Village. *Indonesian Journal for Health Sciences*, 3(2), 64. <https://doi.org/10.24269/ijhs.v3i2.1843>
- Urbanus, A., Sela, R. L. E., & Tungka, A. E. (2021). Structural and non-structural flood disaster mitigation in South Bolaang Mongondow Regency. *Spatial Journal*, 8(3), 447–458.