

The Influence of Using Disaster Mitigation Book Based Eco-Science on Disaster Mitigation Awareness of Elementary School Students

Listyo Yudha Irawan^a, Putri Mahanani^{b*}, Choirul Anam^c, Indriyani Rachman^d, Murae Fumitoshi^d, Seli Septiana Pratiwi^c

^aDepartment of Geography, Universitas Negeri Malang, Malang 65145, Indonesia

^bDepartment of Elementary School Education, Universitas Negeri Malang, Malang 65145, Indonesia

^cDepartment of Economy, Universitas Negeri Malang, Malang 65145, Indonesia

^dDepartment of Social and Humanities, The University of Kitakyushu, Kitakyushu 808-0135, Japan

*Corresponding author's email: putri.mahanani.fip@um.ac.id

Received: 13 November 2024

Revised: 13 December 2024

Accepted: 30 January 2025

Available Online: 28 February 2025

Copyright © 2025 by Authors,
Published by Environmental Research Center Publishing Group.
This open access article is distributed under a
Creative Commons Attribution 4.0 International license



ABSTRACT

Disaster mitigation is one of the important knowledge areas for students to have from an early age. The existence of environmental damage and climate change that occurs in the surrounding environment, makes students have to be aware of the various disaster risks that can occur. This study aims to describe the effect of the use of eco-science-based disaster mitigation books on disaster mitigation awareness of grade V elementary school students. The research method used is quantitative descriptive research. Activities are carried out using the stages of preparation, implementation, data processing/analysis, and report making. The subjects of the study were 28 students of SDN 3 Turen, Malang Regency. The data collection technique used was a test. The results of the study showed that the use of Eco-Science-based Disaster Mitigation Book learning media in elementary schools can increase students' disaster mitigation awareness. This result is reinforced by an increase in the average pre-test and post-test of students from 80.61 to 95.46. The implications of the study indicate that disaster mitigation books for elementary school students have a positive impact on learning in elementary schools.

Keywords: Disaster, Mitigation, Textbook, Eco-science, Elementary school

1. Introduction

Indonesia is an archipelagic country that has many potentials and risks. Indonesia as an archipelagic country is vulnerable to natural disasters, such as earthquakes, tsunamis, and volcanic eruptions. This is certainly a big challenge in preparing the community, especially children, to understand the risks and disaster prevention measures. Based on the presentation of the head of BNPB, it is known that strengthening disaster knowledge or literacy is very important to be carried out for the entire community, especially those who live in disaster-prone areas, one of which is those who live in areas around volcanoes (Azanella, 2021).

The most appropriate field in preparing a disaster-aware society is through education. As stated in the National Education System Law No. 20 of 2003, it is stated that the goal of Indonesian national education is to develop the potential of students to become people who believe, fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens (Indonesia, 2003). This contains the meaning that education can bring the next generation to become individuals who are knowledgeable, capable, creative, and independent. Awareness related to disaster mitigation is a manifestation of the goal of education to make the next generation of people who are knowledgeable, capable, and creative. This is because the presence of a disaster requires students to be able to understand the indicators of a disaster. Capable can be understood as the right action in dealing with a disaster. While creative, students are also expected to be able to have creativity when a disaster occurs. For example, creativity in making emergency boats in the event of a flood, and so on.

Eco-science based disaster mitigation books integrate aspects of environmental science into disaster mitigation learning. This approach is believed to be able to improve students' understanding of the relationship between the environment and disasters and the importance of environmental conservation as a preventive measure. Studies in various schools show that teaching materials based on local wisdom and the environment are highly effective in improving students' understanding and awareness of the importance of early disaster mitigation (Fajarini, 2014; Kun, 2013).

Eco-science-based books are expected to influence the level of understanding and awareness of fifth grade elementary school students. This book is believed to have a positive impact because the book used has been adjusted to the characteristics of fifth grade elementary school students who are in the critical cognitive development stage, regarding mitigation steps and the ecological impacts of disasters. With this approach, students not only understand mitigation theory but also practice environmental values, which in turn shape disaster-aware behavior from an early age.

2. Material And Methods

2.1 Literature Review

Based on regulations on disaster management, it is stated that a disaster is an event that disrupts and threatens the lives and livelihoods of the community caused by natural or non-natural factors and human factors so that there are victims in the community (Iswahyudi, 2016; Larasati et al., 2017; Ma'sumah et al., 2021; Mulyono and Paramitha, 2022). In general, a disaster is an event or series of events that cause major losses, both to people's lives and the environment. Disasters usually occur due to natural, non-natural, or social factors. Natural disasters are disasters caused by natural phenomena, such as earthquakes, tsunamis, volcanic eruptions, and floods. Non-natural disasters are disasters that occur due to non-natural factors, such as technological failure, environmental pollution, and disease outbreaks. Social disasters are disasters that arise from conflict or instability in society, such as armed conflict, riots, and terrorism. Social disasters often have long-term impacts on social and economic stability (Penulis, 2024).

In facing various disaster threats that can occur, awareness and preparedness are the keys to safety. Preparedness can be understood as a series of activities carried out to anticipate disasters through organizing and taking the right steps so that they can provide benefits (Yanuarto et al., 2019). The National Disaster Management Agency (BNPB) has set April 26 as disaster preparedness day (Yanuarto et al., 2019). This further strengthens the fact that disaster mitigation awareness is essential for all individuals, including the Indonesian people. Many preparedness efforts are useful in various disaster situations. Some important efforts that can be made as a form of disaster mitigation preparedness or awareness include (Yanuarto et al., 2019): (1) understanding the dangers around; (2) understanding the local early warning system; (3) having the skills to evaluate the situation quickly and take the initiative to protect yourself; (4) having a disaster anticipation plan for the family and practicing the plan through training; (5) reducing the impact of hazards through mitigation training; (6) get involved by participating in training.

Disaster mitigation awareness requires a plan. Some of the main efforts in preparing a disaster preparedness plan include (Yanuarto et al., 2019):

1. Have a family emergency plan. This plan includes: (a) analysis of surrounding threats; (b) identification of gathering points; (3) important contact numbers that can be contacted; (4) know the evacuation route; (5) identification of locations to turn off

- water, gas, and electricity; (6) identification of safe points in buildings or houses; and (7) identification of vulnerable family members, such as children, pregnant women, the elderly, people with disabilities.
2. Have a disaster preparedness bag (TSB). This bag usually uses waterproof bag material and is deliberately prepared by family members in case of a disaster or other emergency. This bag aims to prepare for survival when help has not arrived and makes it easier to evacuate to a safe place. Usually, the TSB contains supplies for three days.
 3. Listen to information from various media, such as radio, television, online media, and other official sources.

Disaster management is a series of steps and strategies to minimize the impact of natural and non-natural disasters on society. This stage usually includes three main phases: pre-disaster, during a disaster, and post-disaster. The Pre-Disaster phase involves mitigation activities, such as safe spatial planning, planting trees to prevent drought, and community preparedness education and training. These steps aim to reduce the risk of disaster before it occurs. In the Disaster Phase, management focuses on emergency response, including victim evacuation, provision of medical assistance, and safety protection. The Post-Disaster Phase is the rehabilitation and reconstruction phase after a disaster (Penulis, 2024). One of the disaster management efforts is through community-based disaster risk reduction management (Sair, 2019). Therefore, education as a form of community can be an area to build awareness regarding disaster mitigation.

Elementary school education is the initial education for the next generation of the nation. Learning carried out in elementary schools is based on the curriculum which is the basis for learning activities. Regarding the curriculum in elementary schools, there is local content that can be adjusted to the needs of the school. This is also supported by the regulation of the Minister of Environment and Forestry number 52 of 2019 concerning the Environmental Care and Culture Movement in Schools and Law no. 20 of 2003 concerning the National Education System, articles 36 (1); 37 (1) and 38 (2) which state that one of the activities that can be carried out to provide strengthening knowledge related to the environment and disasters is through local content that can be implemented in schools (Indonesia, 2003; Kehutanan, 2019) .

Early disaster education is essential because children are one of the groups most at risk of disasters. Low knowledge and understanding of disaster risks can result in a lack of awareness and preparedness in dealing with disasters. It was further stated that good disaster management should be integrated into the field of education. This is because education is one of the determining factors in disaster risk reduction activities. These activities can of course be started since children are in the lowest or elementary school (Arifianti, 2011; Sair, 2019). In 2005, a world conference on disaster reduction was held. The conference gave birth to 5 priorities related to disaster reduction. First, ensuring that disaster risk reduction is placed as a national and local priority. Second, identifying, evaluating, and monitoring disaster risks and improving the function of early warning tools. Third, the importance of using knowledge, innovation and education to build a safe and resilient culture at all levels. Fourth, reducing the factors of basic disaster risk factors. Fifth, strengthening disaster preparedness or awareness with appropriate responses at all levels (Sair, 2019). Japan is one of the countries that has provided education related to disaster management since early on. This country can be an example in order to campaign for efforts to minimize losses that can occur due to disasters that come. Almost all of its residents have been trained since early on in efforts to deal with emergencies (Arifianti, 2011).

Books are one of the media that are easily accessible to all groups, do not require other media to access them so that the procurement costs are relatively cheaper and with the support of the government as the organizer of learning, the problems of access, support costs and novelty are simultaneously overcome. Furthermore, it is said that books are visual media that can make students learn optimally if they interact with stimuli that match their learning style. The combination of images and writing that are arranged makes information easier to understand, comprehend and enjoyable (Arifianti, 2011).

Based on previous research results, books have been proven to improve students' knowledge and character. This is in line with research results which state that books oriented towards local excellence can improve students' character (Wijayanti, 2019). Other research results also convey that digital books for traditional houses based on AR can increase children's interest in learning (Ningsih and Dijaya, 2022).

Ecosystem science or eco-science is the study of the interrelationships between living organisms, physical features, biochemical processes, natural phenomena, and human activities in ecological communities (NOAA, 2023). Models in Ecosystem Science is a comprehensive review of ecosystem modeling, highlighting its crucial role in advancing ecosystem science. It is often useful for analyzing complex interactions in ecosystems, predicting change, and providing a framework for empirical research. Several key themes include: (1) The Role of Models: Models offer a structured approach to ecological data, allowing scientists to make informed predictions about environmental dynamics and responses. (2) Types of Models: A variety of modeling methods, including theoretical and field-based approaches, help explain ecological phenomena. (3) Applications in Research: Modeling provides valuable insights for ecosystem management, environmental policy, and conservation efforts (Canham et al., 2003; Weathers et al., 2021). An ecosystem is a unified order that is whole and comprehensive between all elements of the environment and influences each other. Based on Environmental Law Number 32 of 2009, an Ecosystem is an order of environmental elements that is a complete and comprehensive unity and influences each other in forming the balance, stability, and productivity of the

environment. The ecosystem concept provides a comprehensive framework for studying the interactions between individuals, populations, and communities and their abiotic environment, and for studying changes in these relationships both temporally and spatially (Weathers et al., 2021). Therefore, eco-science-based disaster mitigation books are expected to help increase awareness of elementary school students about disaster mitigation, including introducing reciprocity between organisms in an ecological community/environment around them.

2.2 Method

The research method used in the study is quantitative because it aims to test the cause and effect between variables by controlling certain variables. The type of method used is quantitative descriptive because it will provide an overview of the research results using simple statistics to facilitate interpretation. The type uses a pre-experimental design with one group pretest-posttest design. The pre-experimental method is a type of quantitative research that aims to test the effect of a treatment or intervention on a particular variable, but does not use a strict comparison or control group. The technique used in this research is a test. The research instrument is a test question. There are several indicators in the development of the test carried out, namely: (1) types of natural disasters; (2) causes of natural disasters; (3) impacts of natural disasters; (4) attitudes before, during and after natural disasters. From these indicators, 15 questions were developed to be used in research activities.

The subjects of the study were 28 fifth grade students of SDN 3 Turen. The school address is at Jalan Jagalan Gg 1 No 1 RT.03 RW.14 Turen, Malang Regency. The research instrument is a test question. The instrument has been tested for validity and reliability before being used. Furthermore, based on the results of the two tests, only questions that are declared valid and reliable will be used in the study. Data analysis using quantitative descriptive research using frequency distribution and data visualization. Both forms will make it easier to provide an understanding of the research results. Frequency distribution will display data in the form of a frequency distribution table or histogram to understand data distribution patterns. While data visualization will use diagrams to present data visually so that patterns and trends can be more easily identified and understood.

3. Results

Table 1. Results of Test Question Validity Test

		Correlations																
		Soal No.1	Soal No.2	Soal No.3	Soal No.4	Soal No.5	Soal No.6	Soal No.7	Soal No.8	Soal No.9	Soal No.10	Soal No.11	Soal No.12	Soal No.13	Soal No.14	Soal No.15	Semua	
Soal No.1	Pearson Correlation	1	-.234	.200	.231	.078	.389*	.000	.167	.000	.120	.000	.389*	.000	.158	.260	.450*	
	Sig. (2-tailed)		.251	.327	.257	.705	.049	1.000	.416	1.000	.558	1.000	.049	1.000	.440	.199	.021	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.2	Pearson Correlation	-.234	1	-.171	.234	.370	.212	.282	-.065	.066	.178	.104	.212	.012	.283	.007	.426*	
	Sig. (2-tailed)	.251		.403	.251	.063	.298	.163	.753	.747	.384	.614	.298	.954	.161	.974	.030	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.3	Pearson Correlation	.200	-.171	1	.200	.234	.234	-.085	.300	-.085	-.072	-.133	.234	.185	.253	.330	.357	
	Sig. (2-tailed)	.327	.403		.327	.251	.251	.679	.136	.679	.726	.516	.251	.365	.212	.100	.073	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.4	Pearson Correlation	.231	.234	.200	1	.389*	.234	.426*	.167	.213	.120	.333	.078	.154	.632*	.087	.723*	
	Sig. (2-tailed)	.257	.251	.327		.049	.251	.030	.416	.296	.558	.096	.705	.452	<.001	.674	<.001	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.5	Pearson Correlation	.078	.370	.234	.389*	1	.212	.066	.104	.066	.178	.272	.212	.168	.443*	.182	.646**	
	Sig. (2-tailed)	.705	.063	.251	.049		.298	.747	.614	.747	.384	.178	.298	.412	.023	.373	<.001	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.6	Pearson Correlation	.389*	.212	.234	.234	.212	1	-.149	.104	.066	.178	.272	.527**	.012	-.037	.182	.564*	
	Sig. (2-tailed)	.049	.298	.251	.251	.298		.466	.614	.747	.384	.178	.006	.954	.858	.373	.003	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.7	Pearson Correlation	.000	.282	-.085	.426*	.066	-.149	1	.178	.114	-.154	.178	.066	.181	.101	-.259	.308	
	Sig. (2-tailed)	1.000	.163	.679	.030	.747	.466		.385	.580	.453	.385	.747	.376	.623	.202	.126	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.8	Pearson Correlation	.167	-.065	.300	.167	.104	.104	.178	1	-.053	.020	-.264	.104	.450*	-.013	.159	.364	
	Sig. (2-tailed)	.416	.753	.136	.416	.614	.614	.385		.796	.922	.193	.614	.021	.949	.438	.068	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.9	Pearson Correlation	.000	.066	-.085	.213	.066	.066	.114	-.053	1	-.154	-.284	.066	-.247	-.118	-.018	.081	
	Sig. (2-tailed)	1.000	.747	.679	.296	.747	.747	.580	.796		.453	.159	.747	.224	.566	.929	.693	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.10	Pearson Correlation	.120	.178	-.072	.120	.178	.178	-.154	.020	-.154	1	.281	.178	-.390*	.209	.052	.261	
	Sig. (2-tailed)	.558	.384	.726	.558	.384	.384	.453	.922	.453		.165	.384	.049	.305	.800	.198	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.11	Pearson Correlation	.000	.104	-.133	.333	.272	.272	.178	-.264	-.284	.281	1	-.065	-.051	.158	-.029	.304	
	Sig. (2-tailed)	1.000	.614	.516	.096	.178	.178	.385	.193	.159	.165		.753	.803	.440	.889	.130	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.12	Pearson Correlation	.389*	.212	.234	.078	.212	.527**	.066	.104	.066	.178	-.065	1	.012	.283	.007	.536*	
	Sig. (2-tailed)	.049	.298	.251	.705	.298	.006	.747	.614	.747	.384	.753		.954	.161	.974	.005	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.13	Pearson Correlation	.000	.012	.185	.154	.168	.012	.181	.450*	-.247	-.390*	-.051	.012	1	.098	.040	.288	
	Sig. (2-tailed)	1.000	.954	.365	.452	.412	.954	.376	.021	.224	.049	.803	.954		.635	.846	.153	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.14	Pearson Correlation	.158	.283	.253	.632*	.443*	-.037	.101	-.013	-.118	.209	.158	.283	.098	1	.055	.571**	
	Sig. (2-tailed)	.440	.161	.212	<.001	.023	.858	.623	.949	.566	.305	.440	.161	.635		.790	.002	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Soal No.15	Pearson Correlation	.260	.007	.330	.087	.182	.182	-.259	.159	-.018	.052	-.029	.007	.040	.055	1	.316	
	Sig. (2-tailed)	.199	.974	.100	.674	.373	.373	.202	.438	.929	.800	.889	.974	.846	.790		.116	
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	
Semua	Pearson Correlation	.450*	.426*	.357	.723*	.646**	.564**	.308	.364	.081	.261	.304	.536**	.288	.571**	.316	1	
	Sig. (2-tailed)	.021	.030	.073	<.001	<.001	.003	.126	.068	.693	.198	.130	.005	.153	.002	.116		
	N	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	

*. Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS 29 Output Instrument Validity

Based on the test results using SPSS v29, the following are the results of the validity and reliability tests of the research instrument. There are 7 valid test questions, that are numbers: 1,2,4,5,6,12,14 with a significance level of 0.5% and 0.1%. This result indicates that nearly half of the test items (7 out of 15) met the statistical criteria for validity and can effectively measure the constructs related to disaster mitigation awareness. Valid test items showed significant correlations with the total test score, meaning they were capable of distinguishing students with higher and lower levels of understanding in the tested domain. Items that failed to meet the validity threshold likely lacked alignment with the intended indicators or were ambiguous in phrasing, which can reduce their discriminatory power. Consequently, only the validated items were retained for further use in post-instruction assessment to ensure the accuracy and integrity of the measurement tool. The validated items represent essential dimensions of disaster knowledge such as types, causes, impacts, and appropriate responses to natural disasters, aligning with the learning objectives of the eco-science-based intervention.

Table 2. Reliability of Test Questions
Case Processing Summary

		N	%
Cases	Valid	26	100.0
	Excluded ^a	0	.0
	Total	26	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Part 1	Value	.590
		N of Items	8 ^a
	Part 2	Value	.073
		N of Items	7 ^b
	Total N of Items		15
Correlation Between Forms			.717
Spearman-Brown Coefficient	Equal Length		.835
	Unequal Length		.836
Guttman Split-Half Coefficient			.795

a. The items are: Question No.1, Question No.2, Question No.3, Question No.4, Question No.5, Question No.6, Question No.7, Question No.8.

b. The items are: Question No.8, Question No.9, Question No.10, Question No.11, Question No.12, Question No.13, Question No.14, Question No.15.

Source: SPSS Output 29 Instrument Reliability

Based on the data above, the number of participants who answered the question was 26 participants so that the criteria used a comparison of the calculated r results with the table r with a significance level of 5% of 0.388. The calculated r result of 0.795 is greater than the table r of 0.388. Therefore, it can be concluded that the test questions used are reliable. After the instrument test was carried out, a trial was then carried out at SDN 3 Turen, Malang Regency. The trial research activity was carried out on October 6, 2023. The activity began with the provision of information from the teacher regarding the learning activities to be

carried out. The activity material is disasters. Furthermore, the teacher gave pre-test questions to determine the students' initial abilities. Furthermore, students and teachers studied together regarding disaster material using the Eco-Science-based Disaster Mitigation Book with earthquake sub-material. This material was chosen because it was considered the most relevant to the situation and conditions in the school environment. In the final learning activity, students worked on the post-test that had been prepared using a validated instrument. The following are the results of calculations using SPSS v29.

Table 3. Descriptive Statistical Results

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Post-Test	28	29	71	100	95.46	7,786
Pre-Test	28	57	43	100	80.61	16,681
Valid N (listwise)	28					

Source: SPSS Output 29 Pre-Test and Post-Test Data on Students' Disaster Mitigation Awareness

Based on the results of SPSS v29 calculations, it can be concluded:

1. The average score of students during the pre-test was 80.61. While the average score of students' post-test was 95.46. These results indicate that there is an increase in the score for the average score of students before and after the use of eco-science-based disaster mitigation books.
2. The standard deviation of the students' pre-test results was 16,681, while the standard deviation of the students' post-test results was 7,786. These results indicate that the post-test results are more uniform in value than the pre-test results.
3. The lowest pre-test score was 43 and the highest score was 100. This means that the range of scores between students' pre-test scores was 67 points. Meanwhile, the lowest post-test score was 71 and the highest score was 100. This means that the range of scores between students' post-test results was 29 points

4. Discussion

Indonesia is one of the countries that is prone to disasters. Many disasters, whether geological, meteorological, drought, and fires, often occur in Indonesia. This condition is solely because Indonesia is located on the "world's ring of fire". The existence of this path makes the world's volcanic and seismic paths very active and dynamic. This path grows and develops volcanoes that also overlap with the most active earthquake paths in the world so that at any time it can give birth to volcanic eruptions, landslides, earthquakes, and tsunamis (Tjandra, 2017). This is reinforced by information on the eruption of Mount Semeru, one of the highest volcanoes in Indonesia located in East Java, in the last 5 years or so. (Ma'sumah et al., 2021; Mulyono and Paramitha, 2022; Nadhiroh, 2023).

The current curriculum in Indonesia is the Merdeka Curriculum. In this curriculum, there are three main phases in elementary school education (SD), namely Phase A for students in grades 1 and 2, phase B for students in grades 3 and 4, and phase C for students in grades 5 and 6 (Aditomo, 2022; Makarim, 2024, 2022). Based on the current curriculum, learning at all levels, including in elementary schools, should follow the learning outcomes that have been outlined in government regulations. Based on the studies that have been conducted, there are competencies related to disaster material that should be possessed by grade V elementary school students. Based on these results, the research conducted in grade V elementary school is very relevant if it raises the theme of disaster mitigation awareness. Disaster mitigation awareness can be interpreted as an individual's understanding and awareness of the potential and risks of disasters that occur in the environment. This awareness can include knowledge of the type of disaster, the impact of the disaster, and the steps that must be taken to reduce the risk or loss if a disaster occurs (Noor, 2014; Suryaningsih and Fatmawati, 2017). Based on this study, this study has also accommodated disaster mitigation awareness which is stated in the research instrument in the form of test questions. Initially, the research team had created 15 test questions based on indicators. However, after conducting validity and reliability tests in class V at another school, namely at SDN 1 Glanggang, Malang Regency, the results showed that there were 7 test questions that were declared valid and all test questions were declared reliable. Based on these results, the instrument used in the study was a test question that had been declared valid and reliable. Learning media plays an important role in the success of learning activities. Learning media in the form of textbooks

are commonly used in every learning process in Indonesia. The use of appropriate learning media can improve the quality and learning outcomes of students. This is in accordance with previous studies which revealed that the use of various learning media has succeeded in improving student learning outcomes in elementary schools (Arifianti, 2011; Asyhari and Silvia, 2016; Dyah Arini Miga, 2018; Mahanani et al., 2021; Silverman et al., 2019). Based on the results of calculations using SPSS v29 related to the pre- and post-test scores carried out on the research subjects, it is known that there was an increase in the average learning outcomes. These results can be seen from the smaller standard deviation compared to the pre-test results and the higher mean/average compared to the pre-test results. These results indicate that the learning outcomes obtained by students describe disaster mitigation awareness because in developing the questions or instruments, disaster mitigation awareness indicators were used. Constructivism Theory, as one of the learning theories used to date in school learning, states that students who learn using learning media can help them to explore and understand concepts more deeply (Koschmann, 2011; Schunk, 2012). This is in accordance with the results of the research that has been presented. Based on the results of the study, information was obtained that the average pre-test results of students were 80.61, while the post-test results of students were 95.46. These results indicate that there was an increase before and after the use of eco-science-based disaster mitigation book learning media for elementary school students. This is also reinforced by the lowest pre-test score of 43 which increased with the lowest post-test score of 71 with the highest score of 100. These results indicate that the teaching book media used can improve student learning outcomes, namely disaster mitigation awareness for elementary school students and in accordance with the learning theory used so far.

5. Conclusion

The use of eco-science-based disaster mitigation books applied in grade V shows an increase in students' disaster mitigation awareness, seen from their learning outcomes. There is an increase in the average pre- and post-test results. The average pre-test and post-test scores of students increased by 14.85. The students' standard deviation also decreased by 8.895, indicating that more students' scores are uniform or almost the same after learning using disaster mitigation books. The implications of the study indicate that disaster mitigation books for elementary school students have a positive impact on learning in elementary schools, so they can be recommended for use in wider areas with almost similar environmental conditions.

Acknowledgments. We are very grateful to the State University of Malang for funding this research. Thanks are also expressed to research partners, Elementary School Teachers in East Java, and all colleagues who have helped with this research.

Declaration of Generative AI and AI-assisted technologies in the writing process. During the preparation of this work, the author(s) used Chat GPT-3.0 to improve readability and language understanding. After utilizing this AI technology, the author(s) meticulously reviewed and amended the content as required, ensuring its accuracy and completeness. The author(s) assume(s) complete accountability for the content of the publication.

Conflict-of-Interest Statement. This research has no conflict of interest whatsoever.

Funding. This research received funding grants from Universitas Negeri Malang.

References

- Aditomo, A. 2022. Keputusan Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Nomor 033/H/KR/2022 tentang Capaian Pembelajaran pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah pada Kurikulum Merdeka.
- Arifianti, Y. 2011. Buku mengenal tanah longsor sebagai media pembelajaran bencana sejak dini. Pusat Vulkanologi dan Mitigasi Bencana Geologi.
- Asyhari, A. and Silvia, H. 2016. Pengembangan media pembelajaran berupa buletin dalam bentuk buku saku untuk pembelajaran IPA terpadu. JIPF Al-Biruni 5(1), 1–13.
- Azanella, L.A. 2021. BNPB: Jumlah bencana 2021 turun tapi dampak bencana naik.
- Canham, C.D., Cole, J.J. and Lauenroth, W.K. 2003. Models in ecosystem science. New Jersey: Princeton University Press.
- Dyah Arini Miga, H. 2018. Peningkatan keterampilan membaca permulaan melalui media big book siswa kelas I. Basic Education 7, 13–20.
- Fajarini, U. 2014. Peranan kearifan lokal dalam pendidikan karakter sosio didaktika: Social Science Education Journal 1, 123–130.
- Indonesia, P.R. 2003. Undang-undang Republik Indonesia Nomor 20 tahun 2003 tentang Sistem Pendidikan Nasional.
- Iswahyudi, E. 2016. Manajemen pengurangan risiko bencana Gunung Semeru berbasis komunitas (Studi Kasus Pada Penanganan Pra Bencana di Desa Supit Urang Kecamatan Pronojiwo Kabupaten Lumajang). Repository Universitas Jember.

- Kementerian Lingkungan Hidup dan Kehutanan. 2019. Peraturan Menteri LHK Nomor 52 tahun 2019.
- Koschmann, T. (Ed.). 2011. Theories of learning and studies of instructional practice. Springer New York, New York, NY, 39(3), 293–307.
- Kun, P.Z. 2013. Pembelajaran sains berbasis kearifan lokal. Seminar Nasional Fisika dan Pendidikan Fisika Ke-3 2013, Sebelas Maret University.
- Larasati, Z.R., Hariyanto, T. and Kurniawan, A. 2017. Pemetaan daerah risiko banjir lahar berbasis SIG untuk menunjang kegiatan mitigasi bencana (Studi Kasus: Gunung Semeru, Kab. Lumajang). JTITS 6, C363–C368.
- Ma'sumah, M., Negara, P.D., Akbar, R.L., Maharani, Y.G. and Aisyah, F.A. 2021. Implementasi program kemanusiaan MBKM Tim Pulih Semeru untuk bantu pemulihan kondisi pasca erupsi Gunung Semeru di Pronojiwo, Lumajang, Jawa Timur. Conference on Innovation and Application of Science and Technology 10.
- Mahanani, P., Sutarno, Muchtar. 2021. Big book based on SAS method using Kvisoft application to strengthen reading literacy for student. 2021 7th International Conference on Education and Technology (ICET), IEEE, Malang, Indonesia, pp. 235–240.
- Makarim, N.A. 2022. Permendikbudristek No. 262/M/2022 tentang Pedoman penerapan kurikulum dalam rangka pemulihan pembelajaran.
- Makarim, N.A. 2024. Permendikbudristek Nomor 12 tahun 2024 tentang Kurikulum pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah.
- Mulyono, J. and Paramitha, N.A. 2022. Management of the Mount Semeru eruption disaster through social capital. IJESSR 05, 307–319.
- Nadhiroh, F. 2023. Gunung Semeru erupsi lagi, tinggi letusan 800 meter.
- Ningsih, M.F. and Dijaya, R. 2022. Buku saku digital untuk rumah adat berbasis augmented reality.
- NOAA. 2023. What is ecosystem science.
- Noor, D. 2014. Pengantar mitigasi bencana geologi. Yogyakarta: Depublish Publisher.
- Penulis, T. 2024. Definisi & Jenis Bencana.
- Sair, A. 2019. Bencana dan “proyek” kurikulum kebencanaan di sekolah. JUS. Journal of Urban Sociology 1, 4.
- Schunk, D.H. 2012. Learning theories: an educational perspective. 6th ed. Boston: Pearson.
- Silverman, R.D., Artzi, L., McNeish, D.M., Hartranft, A.M., Martin-Beltran, M. and Peercy, M. 2019. The relationship between media type and vocabulary learning in a cross age peer-learning program for linguistically diverse elementary school students. Contemporary Educational Psychology 56, 106–116.
- Suryaningsih, E. and Fatmawati, L. 2017. Pengembangan buku cerita bergambar tentang mitigasi bencana erupsi gunung api untuk siswa SD. PPD 4, 113–124.
- Weathers, K.C., Strayer, D.L. and Likens, G.E. 2021. Fundamentals of ecosystem science, second. ed. Academic Press Elsevier Inc.
- Wijayanti, T.S. 2019. Pengembangan buku saku biologi berorientasi keunggulan lokal untuk meningkatkan karakter peserta didik 4.