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Learning Strategies for Disaster Mitigation Education at the Elementary School Level: A Systematic Literature Review

Sartika Yolanda[1], Yunus Abidin[2], Dede Trie Kurniawan[3]
[1,2,3]Universitas Pendidikan Indonesia, Indonesia

[1]yolandasartika@upi.edu

Abstract

Natural disasters are indiscriminate in their victims; elementary school-aged children are highly vulnerable to these events. However, disaster mitigation education for elementary school students remains scarce, and mitigation efforts in each region have unique characteristics that need to be adapted by educational units in various areas. This study aims to identify disaster mitigation learning strategies for elementary school students and to determine the most effective learning strategies that can be implemented by educational units in elementary education. This research is a Systematic Literature Review conducted by identifying, reviewing, evaluating, and interpreting all available research. The design used in this study involves summarizing, reviewing, and analyzing 10 articles focusing on disaster mitigation in elementary schools, specifically two articles published in Q2 reputable journals and the rest in nationally accredited Sinta journals. These articles were retrieved from online journal databases such as Google Scholar, ResearchGate, SINTA, DOAJ, ERIC, and Scopus. The results of this research indicate that disaster mitigation learning strategies in elementary schools can be implemented using various teaching materials and learning media with visual learning styles, diverse simulation- and practice-based learning models and approaches, tailored to the characteristics of the disaster mitigation material and the age of elementary school students.
Keywords: *disaster mitigation; elementary school students; learning strategies*

Introduction

Natural disasters are a serious threat, especially to children who are the most vulnerable people in such situations and cannot protect themselves from the dangers of natural disasters yet (Rahesli Humsona et al., 2019; Wahyuni, 2022). Meanwhile, Indonesia is a country that is quite highly susceptible to disasters. Indonesia has the most active volcano in the world and is a meeting point for two tectonic plates, resulting in the potential for earthquakes, tsunamis, and volcanic eruptions. Furthermore, Indonesia is also known as an area that is crossed by the fire belt or ring of fire (Akbar et al., 2018; Lestari et al., 2023; Suarmika & Utama, 2017)), in addition to the territory of Indonesia that is located in the megathrust zone with a high magnitude potential. Indonesia megathrust has 5 active plate zones, including Philippine Thrust, Northern Sulawesi Thrust, Banda Megathrust, Sumatran Megathrust, and Java Megathrust, the plate that threatens the most populous island (Suhartono & Melinda, 2024). The areas along the southern coast of Java in particular highly pose dangers and risks of large earthquakes (megathrusts) that also have the potential to cause tsunamis (MAIPARK, 2020).

With such characteristics, Indonesia is prone to many natural disasters, such as floods, landslides, tsunamis, earthquakes, storms, droughts and even forest fires (Andwitasari & Handayani, 2022; Suhardi, 2019). As a country with various disaster potential, Indonesia has several fairly good disaster countermeasure procedures and steps. In this case, the Indonesian National Disaster Management Agency (BNPB) has a clear legal basis and performance in handling disasters. However, disaster management certainly requires cooperation from all parties (PPPSDA, 2017), starting from the central government, regional government, stakeholders, and the community.

BNPB is not the only institution that can carry out disaster management. The educational institution has an equally important role in disaster prevention, particularly in terms of disaster mitigation, as well

(Ihsan et al., 2022). The formal education sector has significant potential in contributing to disaster management efforts and is considered the most effective in assisting to reduce the effect of disaster risk (Arifa, 2018; Hamid et al., 2021). Education can contribute to the dissemination of information about the characteristics of potential disasters in the surrounding area, strategies for managing such disasters, and the necessary preparations to undertake before a disaster strikes (Suharwoto et al., 2015; Zahara, 2019). During a disaster, elementary education is the most vulnerable educational institution since the elementary school-aged children do not yet have sufficient knowledge and skills to deal with disasters (Ayub et al., 2020; Septikasari et al., 2022). They are vulnerable to disasters due to their lack of knowledge about how to save themselves and their tendency to panic. This makes them unprepared for disasters. When a disaster occurs, they are increasingly vulnerable because they are unable to protect themselves and are often far from parental supervision (Fitri et al., 2023). Elementary school education is crucial in equipping students to cope with disasters, which necessitates that schools consider various methods and strategies for delivering disaster mitigation education. This includes not only how to effectively communicate the information to students but also the frequency and depth of the material presented to them. Therefore, current study aims to review several disaster mitigation studies in elementary schools level in order to see what strategies were used in several previous schools, either in Indonesia or several other countries.

Method

This research project applied Systematic Literature Review (SLR) method. SLR is a systematic literature review method to identify, assess, and interpret research findings in order to answer previously determined research questions. This process was carried out by identifying, analyzing, assessing, and interpreting all the existing research. This approach allows the researchers to conduct a structured review and identify journals by following the predetermined stages (Putra & Afrilia, 2020; Triandini et al., 2019). Furthermore, this research design also aims to summarize, review, and analyze a number of studies that focus on disaster mitigation activities for elementary school students, with research themes identified through searches from various sources. In order to complete this research, researchers collected journal articles from various platforms, including Research Gate, Google Scholar, DOAJ, ERIC, SINTA and Scopus. In this case, the keywords used are Disaster Mitigation in Elementary Schools, with articles collected from publications between 2020 and 2024.

Furthermore, the article search obtained 10 articles on Disaster Mitigation at the elementary school level. Among them, one article is published in a reputable Q2 journal, while the remainings are published the Sinta-accredited National Journal. The articles were then analyzed to evaluate the concepts, materials, strategies, and techniques for implementing disaster mitigation at the elementary school level. The first step carried out in this study is determining the research problem, continued by data searching through electronic journals in ERIC and Google Scholar, obtaining more than 10 relevant articles for further analysis.

Results

Based on the results of the article search, learning strategies for elementary school children require several approaches, including using a variety of media, creating guidebooks, and creating game strategies and disaster simulations. The researcher found 2 articles published in reputable Q2 journals, while the other 8 articles were published in the Sinta-accredited National Journal. The following Table 1 presents the articles' information, including the author's name, year of publication, research questions, and research methods applied.

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Table 1. Year of Publication of Articles and Research Objectives

No	Author's Name and Year of Publication	Research Objectives	Research Methods
1	(Sujinah et al., 2023)	This research was conducted to design a photo-based digital comic that combines local cultural elements with practical disaster mitigation steps as disaster teaching materials in schools.	Research and Development (R&D)
2	(Septikasari et al., 2024)	This research was conducted to analyze the strategy of integrating disaster education in elementary schools located in disaster-prone areas.	Q*ualitative research using descriptive design*
3	(Yulinda et al., 2023)	This research aims to produce three-dimensional miniature media made of paper, to help the 6th grade elementary school students' understanding of disaster mitigation.	Research and Development (R&D)
4	(Johan et al., 2022)	This research aims to describe the results of the analysis related to the need to develop an E-book on Earthquake Disaster Mitigation.	Qualitative research
5	(Syahril et al., 2021)	This research aims to develop a disaster mitigation learning model for teachers and students at the elementary school level.	Research and Development (R&D)
6	(Salsabila & Dinda, 2021)	This research aims to develop a disaster mitigation model in elementary schools.	Literature review of Research and development through
7	(Setiono et al., 2021)	This research aims to identify the need to develop a learning model on earthquake disaster mitigation based on traditional Bengkulu games.	Research and Development (R&D) through ADDIE model
8	(Nuriman et al., 2022)	This research aims to develop a disaster mitigation guidebook in areas affected by Mount Semeru.	Research and Development (R&D) of 4D, including Define, Design, Develop, and Diseminate
9	(Irwanto et al., 2024)	This research aims to understand the role of schools in disaster mitigation education, the obstacles faced in implementing disaster mitigation, and the impacts of implementing disaster mitigation education.	Descriptive Qualitative Research
10	(Qurrotaini & Nuryanto, 2020)	This study aims to determine the extent to which the implementation	Descriptive Qualitative Research

	of disaster mitigation education related to natural disasters such as earthquakes is applied in social studies learning in elementary schools

Based on table 1 above, the themes or titles of the research involved are all related to Disaster Mitigation and were implemented in elementary schools. The year of publication of the articles is between 2020 and 2024. Furthermore, among the 10 articles involved, most of the research methods applied Research and Development (R&D) method, 3 with descriptive qualitative research development, 2 4D research, and then literature reviews. Articles on disaster mitigation indicate that there is a significant gap in research regarding the development of disaster mitigation education for elementary school students in Indonesia. This is particularly concerning given that children in this age group are highly vulnerable to disasters. Furthermore, it is essential to tailor the characteristics of disaster information to reflect the specific needs of each region.

Additionally, the findings from the ten articles discuss disaster mitigation learning strategies that align with the characteristics of elementary school students. The research results indicate whether these strategies effectively enhance students' knowledge about disaster mitigation, improve their skills in disaster preparedness, and influence their attitudes towards disasters and disaster victims in their vicinity. Various learning strategies, including different types of teaching materials, learning media, and models and approaches suitable for disaster mitigation content tailored to the characteristics of elementary school students, are summarized in Table 2.

Table 2. Learning Strategy on Disaster Mitigation and Research Findings

No	Author's Name and Year of Publication	Learning Strategy on Disaster Mitigation	Research Findings
1	(Sujinah et al., 2023)	Applying a photo-based digital comic strategy and a local wisdom-based drama method	The development of photo-based digital comics that address disaster mitigation and incorporate local wisdom for drama-based learning in schools is an urgent requirement that teachers and students are eager to have in the educational process.
2	(Septikasari et al., 2024)	The integrated disaster education model is an online integrated disaster education model using a website	Schools that implement integrated disaster education will increase knowledge about disaster risks and preparedness
3	(Yulinda et al., 2023)	The results of this study are in the form of three-dimensional miniature media made of paper, which aims to improve the understanding of the 6th grade	The media developed is in the form of three-dimensional miniatures accompanied by guidebooks and materials.

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		elementary school students about disaster mitigation. The development of this three-dimensional miniature media has gone through various process stages.	The development of this media has gone through various stages of research, resulting in valid, practical, and effective media.
4	(Johan et al., 2022)	Development of an E-book on Earthquake Disaster Mitigation for students with disabilities at the elementary school level.	Based on the results of the study, it is concluded that earthquake disaster mitigation learning requires teaching materials in the form of electronic books (e-books) specifically for students with disabilities in elementary schools.
5	(Syahril et al., 2021)	Development of a disaster mitigation learning model and teaching materials for both teachers and students in elementary schools.	The use of the Discovery Learning model helps students to better understand disaster mitigation and teachers as facilitators
6	(Salsabila & Dinda, 2021)	Development of a disaster mitigation demonstration learning model that is appropriate for the elementary school realm.	Disaster education is implemented through a demonstration model, which includes cognitive, affective, and psychomotor aspects in the context of disaster management, with the aim of reducing the impact of natural disasters on students.
7	(Setiono et al., 2021)	Development of a learning model aiming to improve knowledge of earthquake disaster mitigation based on the local wisdom of Bengkulu traditional games.	The design of the earthquake disaster mitigation learning model based on traditional Bengkulu games integrated into integrated thematic learning for elementary school students can be concluded that the right theme to use in this learning is "*Daerah Tempat Tinggalku* (My Residential Area)".
8	(Nuriman et al., 2022)	Developing a textbook for natural disaster mitigation education in areas affected by the disaster from Mount Semeru.	The development of valid mitigation education textbooks can be used in learning to provide

			information about disaster awareness related to it.
9	(Irwanto et al., 2024)	Schools serve as facilitators and planners of activities, particularly in the realm of disaster mitigation education. Their primary goal is to equip students with the knowledge, skills, and awareness necessary to minimize risks and mitigate the impacts of disasters. To achieve this, various mitigation measures—both structural and non-structural—have been implemented within the school environment to reduce the potential severity of natural disaster impacts.	The positive impacts of implementing disaster mitigation education include increasing awareness, preparedness in facing disasters, saving lives, and strengthening the school community. Meanwhile, the negative impacts of implementing disaster mitigation education include costs and use of resources, disruption to the curriculum, feelings of fear and anxiety, and the risk of error.
10	(Qurrotaini & Nuryanto, 2020)	The implementation of disaster mitigation is conducted through practical exercises in schools, enabling students to learn self-rescue techniques and prepare for potential disasters. The approach employed is a realistic one, utilizing an expository strategy, with methods that include lectures and demonstrations.	The implementation of earthquake disaster mitigation education in State Elementary Schools has been implemented in elementary school social studies learning, especially in disaster-related materials.

Students need to learn such Disaster Mitigation, especially the students at the elementary school level because they are the most vulnerable humans during the disasters. Hence, this effort should be carried out regularly in the formal education sector at least once a year. The implementation of disaster mitigation learning mostly uses disaster pocket books that are adjusted to the conditions and characteristics of disasters in each different region. It provides learning models that help students find their own information or carry out role play activities and demonstrations regarding the disaster simulation (Salsabila & Dinda, 2021). Students need to learn such Disaster Mitigation, especially the students at the elementary school level because they are the most vulnerable humans during the disasters. Hence, this effort should be carried out regularly in the formal education sector at least once a year. The implementation of disaster mitigation learning mostly uses disaster pocket books that are adjusted to the conditions and characteristics of disasters in each different region. It provides learning models that help students find their own information or carry out role play activities and demonstrations regarding the disaster simulation.

Discussion

Disaster mitigation is a crucial component of the education sector, particularly in the education of elementary school children. As children are among the most vulnerable groups at

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risk of becoming disaster victims, offering early disaster mitigation education can enhance their knowledge and awareness. This proactive approach can significantly reduce the number of victims in the event of a disaster (Susanto et al., 2021). Each research background presents evidence indicating that children are the most vulnerable victims, yet they continue to attend school in hopes of receiving protection when a disaster strikes. This highlights the importance of educational institutions in providing safety and preparedness measures for students in their respective communities.

The implementation of disaster mitigation education in each region requires careful evaluation, as it is essential to first identify significant gaps in student interaction with learning tools and disaster mitigation models that are tailored to the specific characteristics of their area. This presents a crucial opportunity for educational institutions and policymakers to enhance student engagement in geography education, particularly within the context of disaster mitigation (Sugiyanto et al., 2024). To ensure that the tools developed for studying disaster mitigation align with the diverse characteristics and needs of students in different regions, researchers must also take into account the capabilities of teachers and their receptiveness to the media or models designed for implementing disaster mitigation learning activities. This consideration is vital for the effective delivery of educational content and for fostering a supportive learning environment (Syahrial et al., 2021).

The learning media frequently selected for disaster mitigation education is a pocketbook tailored to the characteristics of elementary school children, as well as the specific types of disasters occurring in the research area (Lestati, 2020; Nurkamila, 2024; Pambudi, 2019)In addition to pocketbooks, there are numerous other media options available for disaster mitigation education, including comics, pop-up books, e-modules, and e-books. The integration of teaching materials and disaster mitigation media in digital formats is a primary choice that researchers can develop in this 21st-century learning environment. This digital integration not only captures students' interest but also significantly enhances their motivation to engage with disaster mitigation content (Pratiwi, 2024; Putra & Soelistijo, 2023; Safitri et al., 2023; Sholichah et al., 2023; Zulfiya et al., 2023). The development of digital learning materials and media represents a valuable resource for researchers aiming to create suitable teaching tools tailored to their specific regions. The accessibility of digital teaching materials facilitates this process and allows researchers to build upon the recommendations of previous studies to enhance disaster mitigation educational resources. Furthermore, it is important to note that the most effective learning outcomes for disaster mitigation are often achieved through a visual learning style, which underscores the need for engaging and visually appealing educational content (Prasetya et al., 2024).

The learning models and approaches commonly selected for disaster mitigation education include simulations, demonstrations, role play or drama, and discovery learning. These methods are favored for their effectiveness, as they engage students on multiple levels—cognitive, affective, and psychomotor. By incorporating these interactive and experiential learning strategies, students are better equipped to understand and respond to disaster situations (Suharini & Baharsyah, 2020). Mitigation learning that offers students direct experiences with information sources fosters interaction and engagement, ultimately leading to the development of meaningful learning experiences during the educational process (Setiyawati, 2022). Students are more likely to effectively process and retain information that is valuable and meaningful to them. As a result, when a disaster occurs, they are expected to exhibit a preparedness mindset and be capable of selecting the best actions to ensure their safety during such events.

Conclusion

Disaster mitigation education for elementary schools is an essential component that should be integrated into every curriculum at the educational unit level, yet it is often overlooked. Schools, as formal educational institutions, play a crucial role in providing preventive education aimed at fostering sustainable community safety, particularly because elementary school children are among the most vulnerable victims during natural disasters. To effectively address this issue, disaster mitigation learning should be incorporated into every school, with a minimum of one learning session each academic year. This repetition helps instill good habits in students and cultivates skills that can be effectively utilized in the event of a disaster, ultimately reducing their vulnerability. The implementation of disaster mitigation education must begin with a thorough analysis of the specific needs of each region, as disaster risks and student learning requirements vary significantly. This education can be supported through various teaching materials and visual media, such as pocketbooks, comics, pop-up books, e-modules, and e-books, which can be presented in both digital and non-digital formats. The appropriate learning process for mitigation can be in the form of simulations, demonstrations, role play or drama, and also discovery learning. These are various efforts that have been made and proven to be valid in increasing knowledge about disaster mitigation as well as properly training students' disaster preparedness skills.

Acknowledgment

The findings of this study can serve as a valuable reference and provide recommendations for the development of disaster mitigation education in elementary schools across various regions. Currently, local governments often rely on guidebooks or pocketbooks that may not be adequately tailored to the needs of elementary school children. However, these governments possess the capability to effectively implement disaster simulation processes within schools. Therefore, further research is essential to explore the development of disaster mitigation strategies specifically designed for elementary school children in each region.

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