International Journal of Education, Social Studies, And Management (IJESSM)
e-ISSN : 2775-4154
Volume 4, Issue 3, October 2024
The International Journal of Education, Social Studies, and Management (IJESSM) is published 3 times a year (**February, Juny, November**).
Focus : Education, Social, Economy, Management, And Culture.
LINK : http://lpppipublishing.com/index.php/ijessm

Disaster Mitigation Knowledge Based on Local Wisdom Integration in Elementary Schools

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ARTICLE INFO
Article history:
Received
10 September 2024
Revised
16 October 2024
Accepted
24 November 2024

ABSTRACT

Elementary schools as a basic education environment have limited knowledge and understanding of disaster preparedness, both among students, teachers, and the surrounding community. The lack of effective educational strategies, especially in integrating local knowledge and traditional wisdom, is a major obstacle in preparing elementary schools to face disasters. This study aims to describe and analyze the forms of knowledge obtained from disaster preparedness education based on local wisdom integration for elementary schools. This study uses a qualitative case study method, where participants are selected from various stakeholders involved in elementary education and disaster preparedness. The results of the study indicate that various types of disaster preparedness education knowledge have been identified, including basic knowledge, specific disaster preparedness knowledge, local wisdom knowledge, emergency response and evacuation knowledge, environmental knowledge and prevention, and social knowledge and cooperation. Understanding disaster mitigation can influence students' attitudes and behaviors in facing disasters, so that by providing elementary school students with comprehensive and contextual knowledge about disaster mitigation, equipping them with important and wiser life skills.

Keywords *Disaster Mitigation, Knowledge, Local Wisdom, Elementary School.*

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INTRODUCTION

Disaster risk reduction education in primary schools is essential to prepare students to effectively respond to disasters. Studies have shown that integrating disaster risk reduction education into the school curriculum can improve students' knowledge, attitudes, and preparedness for disasters. (Lukman et al., 2021; Rambau et al., 2012; Sujarwo et al., 2018). This education should include a range of competencies and skills to empower students to actively contribute to disaster preparedness and mitigation efforts. (Sujarwo et al., 2018). In addition, implementing disaster preparedness in schools is essential for the safety and well-being of students and staff (Kawasaki et al., 2022; Widowati et al., 2021).

Studies highlight the importance of early education in disaster preparedness to instill the importance of disaster preparedness. (Akbar et al., 2021). It is suggested that trauma-informed or rehabilitation practices in schools can result in creating better conditions for children after a natural disaster (Le Brocque et al., 2017). In addition, teachers play a vital role in disaster preparedness and must have the necessary skills to manage disasters effectively (Fathoni et al., 2019). Even disaster education aims to increase students' awareness of the impact of disasters and improve their preparedness for natural disasters (Jannah et al., 2021). The American Academy of Pediatrics and the National Association of School Nurses recommend that all schools have a disaster preparedness plan, emphasizing the importance of preparedness in the educational setting (Horton et al., 2023). Psychological preparedness for disasters, including simulations and mitigation training integrated into school curriculum, can help children cope with disasters (Estafetta et al., 2020). Thus, the development of a model such as the Disaster Preparedness and Safety School Model with a multi-hazard approach is considered strategic to ensure schools are prepared for disasters (Widowati et al., 2021).

Children's lack of knowledge and awareness about disaster risk reduction is a critical issue that can exacerbate disaster risks and impacts. Recent studies have shown that one of the main contributing factors is the lack of integration of relevant local content into the primary school curriculum. The current curriculum tends to focus on theoretical aspects and places little emphasis on practical applications that can help children understand and prepare for disaster situations. (Muslim & Makmun, 2020)This situation is further exacerbated by the low quality of teacher training in disaster preparedness education. Many teachers do not have the in-depth knowledge and skills needed to teach disaster preparedness effectively (Rofiah et al., 2024). Other contributing factors are limited resources, such as teaching materials, and disaster simulation support facilities, as well as the lack of support from schools and parents in supporting disaster mitigation programs (Lusmianingtyas & Suwarno, 2022; Pratiwi & Nurfadilah, 2021). Therefore, a comprehensive strategy based on local content integration is needed to improve the effectiveness of disaster preparedness education in primary schools.

Knowledge of disaster preparedness by students, teachers, schools, families, and communities to reduce the impact of natural disasters. In-depth knowledge of disasters and how to deal with them can equip students with essential skills and preparedness to face emergencies. Studies show that students who are trained in disaster preparedness are better able to take appropriate actions during disasters, thereby reducing the risk of injury and

loss of life (Buamona et al., 2023). In addition, teachers also have an important role in conveying this knowledge effectively; they need interactive and practical teaching strategies to ensure students' thorough understanding (Dwiningrum et al., 2020b). Schools as institutions must support this by providing a curriculum that includes disaster preparedness materials and adequate facilities for simulations and exercises (Desilia et al., 2023; Rofiah et al., 2021). Family and community support is also important, because learning does not only occur in schools but also at home and in the community. The involvement of parents and communities in disaster preparedness programs can create a more prepared and resilient environment (Dwiningrum et al., 2020a). Therefore, a holistic and collaborative approach by all stakeholders is essential to effectively minimize the impact of natural disasters.

RESEARCH METHODE

This study aims to analyze disaster mitigation knowledge based on local wisdom integration in elementary schools using a qualitative case study method. In this study, the respondent determination technique was carried out using the purposive sampling method to select respondents carefully and in accordance with the research needs. The respondent selection criteria include principals, teachers, and students from 6 schools that have implemented disaster preparedness education. The advantages of the purposive sampling method are very relevant to the research objectives because they allow for detailed criteria and are in accordance with the focus of the research. By selecting respondents who meet these criteria, researchers can ensure that the data obtained is truly relevant and in-depth in explaining disaster mitigation knowledge based on local wisdom integration. In addition, this method also helps increase sample representation by selecting respondents from different backgrounds and levels of experience, thus providing a more comprehensive picture. Time and resource efficiency are important aspects of this method, because researchers can focus on the most relevant issues without wasting time on less relevant issues.

The data collection methods used were a) semi-structured interviews with principals and elementary school teachers in Medan City, represented by 6 Elementary Schools and 12 respondents. The purpose of the semi-structured interviews was to gain an in-depth understanding of the perspectives of principals and teachers on local wisdom-based disaster mitigation knowledge. The advantage of this approach is that it allows researchers to explore issues in depth through the use of flexible questions. b) Observations were conducted by directly observing classroom learning activities, especially those related to

disaster mitigation education. These observations allowed researchers to observe teaching practices and interactions between teachers and students, thus providing a realistic contextual picture. c) Documentation aims to compile evidence in the form of documents about curriculum guidebooks, teaching guides, and teaching materials.

Table 1.
Responden

School Name & Code	No	Name (Initials)	Position	Gender	Length of work
Alwasliyah 3 Elementary School (SD1)	1	AUD	Headmaster	Man	4 years
	2	BIA	Teacher	Man	10 years
Alwasliyah 4 Elementary School (SD2)	3	FRE	Headmaster	Woman	17 years
	4	HER	Teacher	Man	3 years
Alwasliyah 6 Elementary School (SD3)	5	VIN	Headmaster	Man	8 years
	6	EFA	Teacher	Woman	5 years
Al Faiz Private Elementary School Plus (SD4)	7	RANG	Headmaster	Man	10 years
	8	PUT	Teacher	Woman	4 years
SDN 067777 (SD5)	9	CAH	Headmaster	Woman	7 years
	10	LIS	Teacher	Woman	12 years old
SDN 067264 (SD6)	11	MEG	Headmaster	Woman	8 years
	12	REN	Teacher	Man	4 years

The utilization of Miles and Huberman's interactive model in data analysis of this study offers significant advantages in exploring comprehensive and contextual insights related to Disaster Mitigation Knowledge. The initial stage of the study, data collection, required conducting semi-structured interviews with elementary school principals and teachers, observing learning activities, and documenting student activities. The purpose of the interviews conducted with the Education Office, Principals, and Teachers was to gain insight into Disaster Mitigation Knowledge based on local wisdom. In addition, direct observations were conducted in the classroom to assess practical aspects of the curriculum, including teaching methods, teacher-student interactions, and student responses. Documents on the learning curriculum include a compilation of various curriculum manuals, teaching guides, and instructional

materials. After data collection, the second stage, data condensation, required the researcher to group and summarize the results of the interviews, observations, and documents into relevant categories. This process facilitated the organization of data for further analysis. The third stage, data presentation, involved the visual presentation of findings through the use of tables, graphs, or diagrams. In the final stage, the researcher presented conclusions and verified the results of the analysis. This conclusion is obtained from the patterns that emerge from the presentation of data and can be used to identify problems and respond to research objectives.

RESULT AND DISCUSSION

During the data analysis process, several key findings emerged from the narratives and experiences of the participants. These findings were then organized into categories and presented as main points. The findings include the identification and description of disaster mitigation knowledge based on the integration of local wisdom in elementary schools. The findings of this study are as follows:

Table 3.
Disaster Mitigation Knowledge

Theme	Sub Themes	Coding Report
Basic knowledge	The importance of basic understanding of natural disasters	SD1-BIA, SD2-FRE, SD2-HER, SD3-NIK, SDB-PUT, SD5-CAH
	Presentation of types of natural disasters	SD1-AUD, SD5-LIS, SD6-MEG, SD6-REN
	Understanding the signs of volcanic activity, impacts, and evaluation steps	SD2-HER, SD3-NIK
	Causes of Floods, Types, and How to Prevent Them	SD3-EFA, SD4-RANG, SD4-PUT, SD5-CAH
	Causes of landslides, signs and evaluation steps	SD2-FRE, SD2-HER, SD4-PUT
	Causes of earthquakes, scale of earthquakes, mitigation measures before, during and after an earthquake	SD2-FRE, SD2-HER
Specific Mitigation Knowledge	Volcanic Eruption Disaster: - Recognize the signs: thick smoke, rumbling, and	SD4-RANG, SD4-PUT, SD5-CAH, SD2-FRE, SDH-LIS, SD6-MEG, SD6-REN

Theme	Sub Themes	Coding Report
for Each Disaster	vibrations. - Evacuation measures: evacuation routes and safe assembly areas. - Equipment that must be brought: mask, protective glasses, and essential equipment.	
	Flood: - Preventive measures: make water channels, keep the environment clean, and do not litter. - Actions during floods: evacuate to higher ground, turn off electricity, bring important belongings	SD3-NIK, SD3-EFA, SD4-PUT, SD5-CAH, SD5-LIS, SD6-MEG, SD6-REN
	Landslide: - Recognize the signs: cracks in the ground, leaning trees or poles - Preventive measures: tree planting, terracing. - Evacuation Steps: Stay away from slopes for a safe evacuation route.	SD1-AUD, SD1-BIA, SD4-RANG, SD4-PUT, SD5-CAH
	Earthquake: - Pre-earthquake measures: Make sure the building structure is safe - Actions during an earthquake: take shelter under a table or strong place, stay away from windows and heavy objects that could fall. - Actions after an earthquake: Leave the building in an orderly manner, avoid	SD2-HER, SD3-NIK

Theme	Sub Themes	Coding Report
	damaged buildings, and remain alert.	
Local Wisdom Knowledge	Understand ceremonies and customs to ask for protection from natural disasters	SD6-MEG, SD6-REN
	Studying folk tales that contain disaster mitigation messages	SD3-NIK, SD3-EFA, SD4-RANG, SD5-CAH, SD5-LIS
	Traditional techniques to reduce disaster risk	SD1-BIA, SD2-FRE, SD2-HER
Emergency Response and Evacuation Knowledge	A clear and easy to understand evacuation plan	SD1-AUD, SD4-PUT, SD5-CAH, SD5-LIS, SD6-MEG, SD6-REN
	Participate in regular evacuation drills and disaster simulations.	SD1-BIA, SD2-FRE, SD2-HER, SD3-NIK, SD3-EFA, SD4-RANG, SD4-PUT, SD6-REN
	Knowledge of the use of emergency equipment such as masks, first aid kits, and emergency communication devices.	SD2-HER, SD3-NIK, SD3-EFA, SD4-RANG, SD1-BIA
Environmental Knowledge and Prevention	Plant trees and plants to prevent erosion and landslides	SD4-RANG, SD4-PUT, SD5-CAH, SD5-LIS, SD6-REN
	Keep the environment clean so that the water does not get clogged	SD1-BIA, SD2-FRE, SD2-HER, SD3-NIK, SD3-EFA
	Practice good waste management	SD4-RANG, SD4-PUT, SD5-CAH, SD5-LIS
Social Knowledge and Collaboration	Working together to protect the environment and help each other when disasters occur.	SD1-BIA, SD2-FRE, SD4-RANG, SD4-PUT
	Know how to communicate with family, friends, and authorities during a disaster.	SD4-PUT, SD5-CAH, SD5-LIS

The findings from the basic knowledge of mitigation education that were most frequently identified in the interviews were as follows: first , the importance of a basic understanding of natural disasters; second , exposure to the types of natural disasters; and third , the causes of floods, their types, and protection methods. It is important to emphasize the importance of a basic understanding of natural disasters, given their unpredictable occurrence and the potential damage they can cause. Adequate knowledge of natural disasters allows students to identify potential hazards and take appropriate actions, thereby reducing the risks and negative impacts caused by the disaster. In presenting the various types of natural disasters, students are provided with information about the various types of disasters that may occur, including earthquakes, floods, landslides, and volcanic activity. This understanding requires identifying and clarifying the distinctive characteristics of each disaster, thus allowing students to develop better preparedness. In addition, it is very important to identify the causes of floods, the various types of floods, and the most effective protection methods. Floods can be caused by several factors, including heavy rainfall, overflowing rivers/seas, or damage to water control infrastructure. The classification of floods includes the following types: flash floods, tidal floods, and inundation floods. To protect oneself from the adverse effects of floods, it is essential to gain a thorough understanding of established evacuation procedures, establish effective drainage systems, refrain from carrying out construction activities in areas prone to flooding and preserve the environment.

The findings of specific mitigation knowledge for each disaster most frequently identified in the interviews related to the following four areas: 1) Volcanic Eruption disaster mitigation knowledge, 2) Flood disaster mitigation knowledge, 3) Landslide disaster mitigation knowledge and 4) Earthquake disaster mitigation knowledge. The research findings on specific mitigation knowledge for each disaster indicate the importance of a comprehensive understanding of mitigation measures applicable to different types of natural disasters. In the context of a volcanic eruption, individuals should be able to identify early warning signs, such as the appearance of thick smoke, rumbling sounds, and vibrations. An important component of the evacuation process is an understanding of the designated evacuation routes and identification of safe assembly points. Furthermore, it is essential to ensure the availability of essential equipment, such as masks, goggles, and other vital items, during the evacuation procedure. In the context of a flood disaster, the implementation of preventive measures is essential. This includes the construction of water channels, maintaining environmental cleanliness, and preventing littering. In

the event of a flood, the recommended actions are to evacuate to higher ground, turn off electricity to prevent electrical hazards, and bring essential items.

Furthermore, in the context of landslides, it is important to be able to identify early warning signs, such as the appearance of cracks in the ground or the tilting of trees or poles. To reduce the risk of landslides, it is advisable to take preventive measures, including planting trees and implementing terracing. In the case of evacuation, it is essential to avoid slopes and adhere to designated evacuation routes. In the case of earthquakes, it is essential to ensure the safety and earthquake resistance of the building in question. In the case of an earthquake, it is advisable for individuals to seek shelter under tables or other stable objects and avoid proximity to windows and heavy objects that could fall. In the aftermath of an earthquake, it is essential to evacuate the building in an organized and orderly manner, to avoid any buildings that may have been damaged, and to remain alert for aftershocks.

The most frequently identified local wisdom-related knowledge findings in the interviews were as follows: first, an understanding of ceremonies and traditional traditions used to seek protection; second, a study of folklore, which contains messages that can be used to mitigate disasters; and third, traditional techniques to reduce disaster risk. The results of the study indicate that local wisdom plays an important role in natural disaster mitigation through various approaches that have been passed down from one generation to the next in traditional communities. An understanding of traditional ceremonies and customs intended to seek protection from natural disasters is a manifestation of contemporary local wisdom practices. These traditional ceremonies often involve certain rituals that are considered capable of calming nature and maintaining the balance of the ecosystem, thereby reducing the likelihood of disasters. For example, some indigenous communities in Indonesia practice sacrificial offerings or ceremonies as a means of seeking protection from natural disasters. One way to disseminate local knowledge about disaster mitigation to the younger generation is through the study of folklore that contains these messages. By studying folklore, individuals can gain insight into natural signs to watch out for and steps to take to reduce disaster risk. Furthermore, these narratives serve as powerful pedagogical instruments for the dissemination of knowledge on disaster mitigation through oral media. Furthermore, traditional disaster risk reduction techniques reflect human adaptation to their environment. These techniques encompass a range of practices, including planting specific vegetation to prevent landslides, building houses with local earthquake-resistant materials, and implementing traditional irrigation systems designed to avoid flooding. The application of these traditional techniques

demonstrates a deep understanding of the attributes of the local environment and effective strategies for reducing the consequences of disasters.

The most frequently identified knowledge findings related to emergency response and evacuation in the interviews were as follows: first, a clear and easy-to-understand evacuation plan; second, participation in regular evacuation drills and disaster simulations; and third, knowledge of the use of emergency equipment. The interview results indicated that a clear and easy-to-understand evacuation plan is very important. The interview results indicated the importance of a clear and easy-to-understand evacuation plan. The plan should be effectively communicated to all students and school personnel, including details of evacuation routes, designated safe assembly points, and procedures to be followed in the event of an emergency. The use of easy-to-understand evacuation maps and visualization of evacuation routes in each classroom can improve understanding and preparedness among students in the event of an emergency. In addition, conducting regular evacuation drills and disaster simulations is an effective strategy to improve preparedness. The purpose of these simulations is twofold: first, to practice technical skills and second, to familiarize students and staff with evacuation procedures. This will serve to reduce panic and increase the effectiveness of the response in the event of a real disaster. In addition, students should be instructed on the use of protective masks, providing first aid with the help of a first aid kit, and operating emergency communication devices to call for help. It is also important that these resources are provided and maintained in schools, ensuring their availability in case of emergency.

The most frequently found environmental knowledge and prevention findings in the interviews were 1) planting trees and plants to prevent erosion and landslides, 2) maintaining a clean environment so that water is not blocked, and 3) practicing good waste management. The results of the study on environmental knowledge and prevention show the importance of various efforts to reduce the risk of natural disasters such as erosion and landslides and maintain environmental quality. Planting trees and vegetation plays an important role in preventing erosion. The roots of trees and plants help hold the soil together and increase slope stability, thereby reducing the possibility of landslides. In addition, a dense canopy can reduce the direct impact of rainwater on the soil, which ultimately reduces the rate of erosion. Research shows that waste in the environment can block water flow, cause flooding, and increase the risk of other natural disasters. Therefore, it is important to educate the public about the importance of maintaining a clean environment, including disposing of waste in its place and cleaning water channels regularly. Effective

waste management also includes sorting, recycling, and composting to reduce the amount of waste sent to landfills . In this way, the public can help reduce pollution and improve environmental quality.

Findings from the interviews revealed that the two most frequently cited examples of social cooperation and mutual assistance were first, working together to protect the environment and helping each other in the event of a disaster, and second, knowing how to communicate with family, friends, and authorities during a disaster. The results showed that cooperation in environmental protection and providing assistance to each other during a disaster are important factors in strengthening communities. Such collaboration not only improves the quality of the environment but also fosters a sense of solidarity and collective responsibility among community members. The results of this study indicate that individuals who are accustomed to working together in their daily lives tend to be more prepared and responsive in providing assistance to disaster victims. These individuals not only assist in the evacuation process and provision of necessities, but also provide emotional support to those affected by the disaster. The results of this study indicate that individuals who have the ability to communicate effectively are better prepared to reduce confusion and improve coordination during emergencies. As a result, they are able to convey accurate and timely information to relevant authorities and facilitate the smooth flow of information between family members and friends, which ultimately contributes to the process of making quick and appropriate decisions during a disaster.

Disaster mitigation education is very important to be instilled early on, especially in elementary school students. The cognitive development of children at this age makes it easier for them to accept and understand basic information about various types of natural disasters, as well as mitigation measures. This knowledge not only serves to increase their awareness of the risks in their environment, but also gives them the capacity to respond effectively when faced with a disaster. Furthermore, integrating local wisdom into disaster mitigation education has the added benefit of strengthening the sense of identity and sustainability of local culture. It can be reasonably assumed that elementary school students who are equipped with adequate disaster mitigation knowledge will be better able to protect themselves and others in emergency situations. This will have an impact on reducing the negative impact of disasters on society as a whole.

CONCLUSION

Disaster mitigation education for elementary school students is crucial, as they are at an optimal stage of cognitive development and are best suited to receive basic knowledge and practical skills in responding effectively to natural disasters. Integration of local wisdom not only enhances their understanding but also fosters a sense of cultural identity and sustainability. This approach catalyzes character development, encouraging the growth of environmentally conscious and community-oriented individuals who are actively involved in mitigation activities. Implementing this strategy requires a holistic approach that includes the development of a specific curriculum, teacher capacity building, and the development of collaborative efforts between government agencies, Non-Governmental Organizations (NGOs), and the community. Providing comprehensive knowledge and practical skills to students serves to foster resilience and empower them to face future challenges with wisdom and preparedness. Thus, this approach has the potential to shape a generation that is not only knowledgeable but also resilient in the face of natural disasters.

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