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Child-Friendly Disaster Mitigation Education at Ar-Rahman Kindergarten, Tadukan Raga Village, Deli Serdang

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ABSTRAK

Bencana alam merupakan fenomena yang sering terjadi di Indonesia dan berdampak besar bagi seluruh lapisan masyarakat, khususnya anak-anak sebagai kelompok rentan. Artikel ini bertujuan memperkenalkan konsep mitigasi bencana sejak dini kepada anak-anak usia dini khususnya di TK Ar-Rahman, Desa Tadukan Raga, Deli Serdang. Metode yang digunakan adalah pendekatan kelompok dengan model pembelajaran berbasis storytelling, lagu edukatif, dan simulasi bencana. Hasil kegiatan menunjukkan peningkatan kesiapsiagaan: anak-anak lebih siaga, tertib, serta mampu mempraktikkan langkah penyelamatan diri secara mandiri tanpa panik. Kegiatan ini terbukti efektif meningkatkan pengetahuan dan keterampilan dasar anak dalam menghadapi situasi bencana, khususnya gempa bumi. Disarankan agar program dilaksanakan secara berkala dan melibatkan guru untuk memastikan keberlanjutan dan retensi jangka panjang pengetahuan serta perilaku tanggap bencana.

Kata Kunci: komunikasi bencana,; mitigasi bencana; anak usia dini; simulasi kebencanaan

ABSTRACT

Natural disasters are common in Indonesia and significantly impact all levels of society, especially children as a vulnerable group. This article aims to introduce the concept of disaster mitigation early to kindergarten children at TK Ar-Rahman, Tadukan Raga Village, Deli Serdang Regency. The methods used include group- based learning with storytelling, educational songs, and disaster simulation. Results show improved preparedness: children became more alert, orderly, and capable of practicing self- rescue steps independently without panic. This activity has been proven effective in enhancing basic knowledge and skills in disaster situations, particularly earthquakes. It is recommended that such programs be conducted regularly and include teacher involvement to ensure knowledge and disaster-response behaviors are retained over the long term.

Keyword: disaster communication; disaster mitigation; early childhood; disaster simulation

1. Introduction

Indonesia is geographically located in a highly disaster-prone area, making it vulnerable to various natural hazards such as earthquakes, tsunamis, floods, and landslides. According to Sutopo Purwo Nugroho, Head of the Data, Information, and Public Relations Center of the Indonesian National Disaster Management Agency (BNPB), 2016 was described as a "year of disasters," with 1,985 disaster events recorded—the highest number within the past decade (Syaiful, 2016). Based on Law of the Republic of Indonesia No. 24 of 2007 on Disaster Management, a disaster is defined as an event or series of events that threaten and disrupt the lives and livelihoods of communities, caused by natural and/or human factors, resulting in loss of life, environmental damage, property loss, and psychological impacts.

Natural disasters, particularly earthquakes and tsunamis, consistently cause significant losses. For instance, the earthquake in Palu that triggered a subsequent tsunami resulted in economic losses amounting to approximately IDR 13.8 trillion and caused 2,256 fatalities (Nugroho, 2018). Among these casualties, children constituted a considerable proportion. This condition is largely attributed to children's limited knowledge and skills in responding to disasters, which makes them highly dependent on adults for survival during emergency situations. Therefore, disaster mitigation education from an early age is essential to reduce child casualties (Maulana, 2016; Merchant, 2015; Mudavanhu et al., 2015).

Several countries have implemented innovative approaches to early disaster education. In Japan, for example, disaster mitigation education for young children is delivered through children's literature and creative media, such as picture books, *kamishibai*, children's songs, and films (Damayanti et al., 2020). Research conducted in Niigata and Hachioji further revealed that approximately 80% of parents introduce disaster mitigation concepts at home through storytelling activities related to disasters, highlighting the importance of early and family-based disaster education.

Disasters may cause psychological impacts across all age groups, including infants, children, adolescents, adults, and the elderly. In general, disaster impacts affect physical health, social life, economic conditions, religious life, and psychological well-being. Psychological impacts may manifest as post-traumatic stress, intense recollection of disaster experiences, reduced social support, decreased adaptability to change, lowered self-esteem, and diminished positive outlook on life.

The adverse impacts of disasters can be minimized through preventive efforts known as disaster mitigation. Disaster mitigation refers to a series of measures aimed at reducing disaster risk, either through physical development or through awareness-raising and capacity-building to cope with disaster threats (Government Regulation No. 21 of 2008, Article 1, Paragraph 6; Law No. 24 of 2007, Article 1, Paragraph 9). Furthermore, disaster mitigation as stipulated in Article 47 Paragraph (1) of Law No. 24 of 2007 is carried out to reduce disaster risks for communities living in disaster-prone areas.

Children are among the most vulnerable groups in disaster situations due to their limited knowledge, skills, and physical abilities. Kousky (2016) emphasizes that disaster mitigation for early childhood is crucial, as disasters can adversely affect children's physical health, mental well-being, and educational continuity. A child's ability to cope with and recover from disaster experiences is highly dependent on their surrounding environment, including family, community, and living conditions. Consequently, strengthening disaster mitigation policies and coping strategies for children is imperative.

Recent studies increasingly emphasize the importance of disaster mitigation education from an early age. Güvelioğlu et al. (2023), through a systematic review, confirm that play-based activities, storytelling, and simulation methods are effective in enhancing disaster preparedness among young children. Similarly, a study by Setioputro et al. (2025) in Indonesia demonstrates that school-based programs significantly improve students' understanding of disaster response. In addition, Lee et al. (2023) highlights the critical role of teacher preparedness in ensuring the success of disaster mitigation programs.

However, despite the growing body of research on disaster education for children, several gaps remain. First, many studies tend to focus on general school-age populations, with limited attention given specifically to early childhood learners in kindergarten settings. Second, previous research often emphasizes cognitive understanding of disasters, while fewer studies explore the integration of child-friendly, participatory, and context-based learning approaches that align with young children's developmental characteristics. Third, there is still a lack of empirical studies conducted in local Indonesian contexts, particularly in rural or semi-rural

areas, that examine how disaster mitigation education can be effectively implemented in early childhood education institutions.

Therefore, this study aims to address these gaps by implementing and analyzing a child-friendly disaster mitigation education program at Ar-Rahman Kindergarten in Tadukan Raga Village, Deli Serdang. This study contributes to the existing literature by offering an integrated approach that combines storytelling, songs, and simple simulations tailored to early childhood learners, while also providing context-specific insights into disaster education practices in Indonesian kindergarten settings.

2. Method

The disaster mitigation activity was conducted at Ar-Rahman Kindergarten, Tadukan Raga Village, STM Hilir District, Deli Serdang Regency. This study employed a group-based approach using an inductive learning model, in which children learned through direct experience. The inductive model was selected to facilitate active participation and enable children to construct understanding through practical activities rather than abstract explanations.

Child-Friendly Disaster Mitigation Procedures

The mitigation activities were designed using child-friendly methods and implemented in several sequential stages. The program began with the introduction of the preparedness tagline "I Am Earthquake Ready", followed by the distribution of "earthquake hero" scarves worn by the children to enhance engagement and a sense of readiness. The children then participated in singing and dancing activities accompanied by an earthquake-themed educational song. Earthquake concepts were further explained through storytelling, and the program concluded with an earthquake response simulation.

In the first stage, children were introduced to an educational song about earthquakes with simple lyrics containing basic safety instructions such as "drop, protect your head, and go under the table." The song was performed repeatedly with simple accompanying movements to support memorization and comprehension.

In the second stage, storytelling was delivered using an imaginative character named "Anya the Earthquake-Ready Hero," who experienced an earthquake at her school. Through this narrative, children learned the importance of remaining calm, protecting their heads, and identifying safe places during an earthquake. Storytelling was used to convey disaster messages in a manner that was emotionally safe and developmentally appropriate.

Simulation and Evacuation Practice

The final stage consisted of an in-class earthquake simulation. When a siren or alarm was activated, children were instructed to immediately drop to the ground, cover their heads with their hands, and take shelter under their desks. Teachers and facilitators closely accompanied the children and provided clear, calm verbal guidance throughout the process.

Following the in-class simulation, an evacuation drill was conducted. Children were instructed to line up neatly and exit the classroom in an orderly manner. During evacuation, they were guided to place their school bags over their heads as protective equipment and to rest one hand on the shoulder of the child in front of them. The children were reminded to walk slowly, avoid running, shouting, or pushing, and proceed calmly toward the designated assembly point. The entire simulation activity was carried out twice to reinforce learning and ensure that children could recall and practice the complete sequence of earthquake preparedness actions.

Data Collection and Observation Procedures

Data were collected through structured observations conducted during the implementation of the disaster mitigation activities. The observations aimed to capture children's behavioral responses, level of participation, and ability to follow earthquake preparedness instructions during each stage of the program.

The observations were carried out by the research team, consisting of the primary researcher and two trained assistants. All observers were previously briefed on the objectives of the study and the observation procedures to ensure consistency in data recording.

An observation checklist was used as the primary instrument to systematically document children's responses. The checklist included several indicators, such as: (1) children's ability to follow instructions (e.g., dropping, covering their heads, and taking shelter), (2) level of engagement during singing and storytelling activities, (3) responsiveness during the simulation, and (4) ability to participate in evacuation procedures in

an orderly manner. Field notes were also taken to capture spontaneous behaviors and contextual situations that were not fully represented in the checklist.

To enhance data reliability, observations were conducted simultaneously by more than one observer, and the results were compared and discussed after the activity. This approach allowed for cross-validation of findings and minimized subjective bias in interpreting children's behaviors.

3. Results and Discussion

The implementation of the disaster mitigation activities involved all students of Ar-Rahman Kindergarten. The activities were conducted smoothly and were characterized by high levels of enthusiasm among the children. Based on observational data, most children were able to follow the mitigation instructions correctly, although some still required intensive assistance. Overall, the program was successful in fostering earthquake preparedness behaviour among the children.

Children's Ability to Perform Earthquake Simulation Movements

Observations of children's performance during the earthquake simulation focused on their ability to execute key preparedness movements. Table 1 presents a summary of children's performance in performing the *Drop, Cover, and Hold* procedures, as well as orderly evacuation.

Table 1. Summary of Children's Ability to Perform Earthquake Simulation Movements

Type of Movement	Number of Children Performing Correctly	Number of Children Requiring Assistance
Drop	21	6
Cover	22	5
Hold	22	5
Orderly evacuation from the classroom	24	3

The data indicate that most children were able to perform the *Drop, Cover, and Hold* procedures correctly. The highest level of correct performance was observed during the evacuation stage, where most children were able to exit the classroom in an orderly manner. Nevertheless, a small number of children required guidance, particularly in maintaining correct body positioning and remaining under the table during the *Hold* phase.

Children's Behavioural Responses During the Simulation

In addition to movement accuracy, children's behavioural responses during the simulation were also observed. These behaviors were categorized into three groups: calm and orderly, confused, and panicked or rushed.

Table 2. Categories of Children's Behavior During Disaster Mitigation Simulation.

Behavior Category	Number of Children	Description
Calm and orderly	17	Followed instructions calmly, moved in an orderly manner without panic
Confused	7	Required teacher guidance and occasionally assumed incorrect positions
Panicked / rushed	3	Shouted or moved too quickly and needed to be calmed

Most children demonstrated calm and orderly behaviour during the simulation, indicating a positive level of emotional preparedness. However, a small number of children exhibited confusion or panic, highlighting the need for continued guidance and emotional support during disaster education activities.

Overall, these results are consistent with previous studies emphasizing the effectiveness of play-based learning in developing disaster preparedness among young children. The findings suggest that, through simple and child-friendly methods, children are capable of understanding and practicing basic self-protection procedures. Nevertheless, the need for intensive assistance among some children indicates the importance of repeated programs and routine training. These findings can be further analysed through the perspectives of disaster communication theory, disaster mitigation concepts, and the framework of children as a disaster-vulnerable group.

Disaster communication theory emphasizes the importance of effective information delivery during the pre-disaster phase to enhance preparedness and reduce risk (Haddow, Bullock, & Coppola, 2017). Effective disaster communication must be audience-centered and adapted to the characteristics of message recipients, including age, cognitive capacity, and psychological condition. For young children, disaster-related messages need to be simple, concrete, repetitive, and conveyed through engaging methods.

The findings of this study demonstrate that most children were able to understand and follow mitigation instructions appropriately, suggesting that the disaster communication strategies applied were effective and developmentally appropriate. This finding can also be interpreted through the lens of risk communication theory, which emphasizes the importance of delivering clear, consistent, and actionable messages to reduce uncertainty and enhance protective behaviour (Reynolds & Seeger, 2005). In this study, risk messages such as "drop, cover, and hold" were simplified into repetitive songs and embodied actions, enabling children to translate abstract risk information into concrete behavioural responses. This indicates that effective risk communication for early childhood requires not only message clarity but also transformation into experiential and age-appropriate learning formats.

However, the need for intensive assistance among some children highlights the critical role of educators and facilitators as key communicators in disaster education. According to Bandura's (1986) social learning theory, children acquire new behaviours through observation and imitation of significant others. In this context, teachers functioned as role models, demonstrating appropriate earthquake preparedness behaviours that children could emulate during simulations. In addition, the learning process implemented in this study reflects the principles of participatory disaster education, where children are not positioned merely as passive recipients of information but are actively involved in learning through direct participation. Activities such as singing, storytelling, and simulation allowed children to engage cognitively, physically, and emotionally in the learning process. This participatory approach has been shown to enhance both understanding and retention of disaster-related knowledge, particularly among young learners.

Disaster mitigation refers to a series of efforts aimed at reducing disaster risks and impacts through structural and non-structural measures, including education and capacity building (UNDRR, 2015). Disaster education is a form of non-structural mitigation that focuses on strengthening individual and community preparedness. The results of this study show that early disaster mitigation education can effectively cultivate earthquake preparedness behaviours among young children, such as responding to instructions and performing basic protective actions.

These findings support Wisner et al.'s (2004) argument that increasing community capacity, including among children, is essential for reducing disaster vulnerability. The simulation-based approach employed in this study reflects the principles of experiential learning, which emphasize learning through direct experience as a means of shaping understanding and behaviour (Kolb, 1984). Through simulation, children were able to internalize mitigation practices in a safe and controlled environment.

Nevertheless, the variation in children's levels of independence suggests that disaster mitigation education should not be implemented as a one-time intervention. Paton (2003) emphasizes that preparedness is a continuous process that requires repeated practice to ensure appropriate responses become habitual. Therefore, regular and sustained disaster simulation activities are necessary to strengthen preparedness among early childhood learners.

In disaster studies, children are widely recognized as a vulnerable group due to their physical, cognitive, and emotional limitations in responding to emergency situations (Peek, 2008). Their dependency on adults further increases their vulnerability during disasters. The findings of this study confirm this perspective, as some children still required intensive assistance despite overall positive outcomes. From the perspective of communication strategies for vulnerable populations, the findings highlight the importance of tailoring communication methods to the specific needs and limitations of children. Vulnerable groups, including young children, require communication that is not only informative but also protective in nature—minimizing fear

while promoting adaptive responses. The use of storytelling characters, songs, and guided simulations in this study reflects a protective communication strategy that balances risk awareness with emotional safety. This approach is essential to prevent psychological distress while still fostering preparedness.

However, contemporary disaster risk reduction literature emphasizes that children should not be viewed solely as passive victims, but also as active participants with the capacity to learn and contribute to disaster preparedness (UNICEF, 2012). The mitigation activities conducted in this study provided children with opportunities to develop basic preparedness skills and psychological readiness in facing earthquake risks.

The involvement of teachers and facilitators played a crucial role in creating a protective environment that enabled children to learn without experiencing excessive fear or anxiety. This approach aligns with the principles of child-centered disaster risk reduction, which stress the importance of safe, supportive, and participatory learning environments for children (Mitchell, Tanner, & Haynes, 2009).

The findings of this study reinforce the relevance of disaster communication theory and non-structural disaster mitigation approaches in early childhood education. Effective disaster communication delivered through simulation-based learning can significantly enhance children's preparedness and contribute to the development of disaster-aware behaviour from an early age.

Overall, the integration of disaster communication, risk communication, and participatory learning approaches in this study demonstrates that effective disaster education for early childhood must go beyond information delivery. It should involve interactive, context-sensitive, and emotionally supportive communication strategies that enable children to actively construct understanding and practice preparedness behaviours.

Practically, these results suggest that integrating disaster mitigation education into early childhood curricula can serve as a long-term investment in building a disaster-resilient culture. However, differences in children's comprehension and independence underscore the need for adaptive, continuous, and educator-supported approaches. Strengthening teachers' capacities in disaster communication and embedding mitigation education within routine learning activities are essential steps toward reducing children's vulnerability to disasters.

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4. Conclusion

Based on the findings of this study, it can be concluded that the introduction and simulation of earthquake disaster mitigation for early childhood learners were effective in fostering disaster preparedness behavior. Most children were able to follow mitigation instructions correctly, although some still required intensive assistance. These results indicate that young children possess the capacity to understand and practice basic preparedness behaviors when disaster-related messages are delivered using developmentally appropriate approaches.

The implementation of simple, interactive, and simulation-based disaster communication played a significant role in enhancing children's understanding and preparedness. As a form of non-structural disaster mitigation, simulation-based learning enabled children to acquire preparedness knowledge through direct experience, facilitating the internalization of disaster-responsive behaviors. However, variations in children's levels of independence highlight that disaster mitigation education for early childhood should be conducted continuously rather than as a one-time intervention.

From a theoretical perspective, this study contributes to the development of disaster communication and risk communication frameworks by demonstrating that effective communication for early childhood must be audience-centered, experiential, and participatory. The findings reinforce the relevance of social learning theory, in which children acquire preparedness behaviors through observation and imitation, while also extending its application within the context of disaster education. Furthermore, this study supports the concept of participatory disaster education by showing that active engagement through simulation enhances both cognitive understanding and behavioral readiness among young learners.

As a disaster-vulnerable group, children require adequate support and a safe learning environment during disaster mitigation education. The involvement of teachers and facilitators was found to be a critical factor in reducing children's vulnerability and strengthening preparedness behaviors.

In terms of policy implications, this study suggests that disaster mitigation education should be systematically integrated into early childhood education curricula at both local and national levels. Educational institutions are encouraged to incorporate routine disaster simulation activities as part of their learning programs to ensure the sustainability of preparedness behaviors. In addition, disaster management agencies and education authorities should collaborate to develop standardized, child-friendly disaster education modules and provide continuous training for teachers in disaster communication strategies. Strengthening institutional

support, including the provision of guidelines, learning media, and simulation facilities, is essential to ensure the effective implementation of disaster education for young children.

Overall, this study highlights that building disaster preparedness from an early age requires not only appropriate learning methods but also strong integration between educational practices, communication strategies, and policy support. Such efforts are crucial in fostering a disaster-resilient generation capable of responding adaptively to future risks.

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