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Implementation of the Disaster Risk Mitigation Education Learning Model to Increase Family Preparedness for Flood Disasters in the Kemayoran Area

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ABSTRACT

Flooding is a frequent disaster in urban areas, including Kemayoran, Jakarta, which has the potential to cause physical, economic, and health losses. Family preparedness is an important factor in efforts to reduce the impact of disasters. One strategy that can be implemented to improve family preparedness is through disaster risk mitigation education. This study is a study that uses a Quasi-Experimental research design, with a one-group pretest-posttest design method. This study was conducted by administering a pretest before being given an intervention, after which the intervention was given and finally a posttest was administered. Therefore, this type of research is included in the Quasi-experimental. The results showed that before the intervention, 36 respondents (60%) had a good category of preparedness and 24 respondents (40%) were in the moderate category. After the intervention, the number of respondents with a good category of preparedness increased to 42 respondents (70%), while the moderate category decreased to 18 respondents (30%). The Wilcoxon Signed Rank Test results showed a Z value of -2.336 with a p-value of 0.013 ($p < 0.05$), which means there is a significant difference between the level of family preparedness before and after the intervention. The application of the disaster risk mitigation education learning model has a significant effect on increasing family preparedness for flood disasters in the Kemayoran area. This learning model can be used as a family-based disaster education strategy to improve the community's ability to face the risk of flood disasters.

Keywords: Education, Mitigation, Preparedness, Flood disaster

INTRODUCTION

Indonesia is one of the countries in the world with a very high level of disaster risk. Its geographical location on the Pacific Ring of Fire and influenced by two large oceans makes this region vulnerable to various types of natural disasters, both geological and hydrometeorological. The National Disaster Management Agency (BNPB) recorded that in 2023 there were 5,400 disasters across Indonesia, a higher figure than the previous year [1]. Meanwhile, in 2024, although the number of disasters decreased to 2,107 due to changes in the recording mechanism, the death toll actually increased to 489 people, with 58 people missing, more than 11,538 injured or ill, and more than 6 million people suffering and displaced [1].

Among the various types of disasters that hit Indonesia, floods are the most frequent and have the widest impact on society. Floods are a hydrometeorological disaster that consistently ranks highest in frequency in Indonesia. According to the Center for Research on the Epidemiology of Disasters (CRED), at least 22,000 mass disasters have occurred worldwide, and floods are one of the disaster types that contribute most to this number [2]. The high frequency of flooding in Indonesia is inseparable from the tropical climate with average rainfall between 2,000 and 3,000 millimeters per year, which has the potential to cause excessive water overflow in drainage systems and existing

rivers. Jakarta, as the nation's capital, is one of the areas most vulnerable to flooding. Jakarta's geographical location, located in a lowland area with an average elevation of 7 meters above sea level, crossed by 13 rivers, and directly adjacent to Jakarta Bay, makes it highly susceptible to flooding. History records that the Kemayoran area has experienced major flooding since the colonial era, such as the 1918 flood when the Kemayoran Belakang settlement was inundated with water levels reaching 1.5 meters in some areas (Gunawan, in Indonesiabaik.id). Open Data Jakarta data shows that DKI Jakarta routinely experienced flooding every year between 2013 and 2020, affecting thousands of families.

The Kemayoran area, located in Central Jakarta, is a densely populated area that has historically been repeatedly affected by flooding. Kemayoran is topographically vulnerable to waterlogging, especially during the rainy season with high rainfall intensity. The BMKG Kemayoran Meteorological Station is also used as the primary reference for rainfall monitoring and flood early warnings in the DKI Jakarta area. Climate change, marked by a 1.1°C increase in global temperature, as reported by the IPCC in 2022, has exacerbated the situation by increasing the frequency and severity of extreme hydrometeorological events in the long term [4].

Amidst the recurring threat of flooding, the level of preparedness of communities and families in flood-prone areas remains relatively low. Various studies in Indonesia have shown weak preparedness and emergency response efforts to face disasters independently and proactively, as reflected in the preparedness index of individuals, families, school communities, and the government, which is still in the low category. Research revealed that the low preparedness of communities in densely populated settlements in facing various phases of flood disasters is a determining factor in the magnitude of the resulting losses. Low preparedness has also been shown to correlate significantly with high levels of community anxiety, as shown in a study in Tanjung Muda Village, Sungai Penuh City (2026) which found that 46.2% of respondents had low preparedness and 48.4% experienced severe anxiety ($p = 0.000$).

Family preparedness is a key pillar of a community-based disaster management system. Law Number 24 of 2007 concerning Disaster Management mandates that disaster risk reduction efforts must involve all components of society, including the family as the smallest unit within society. Disaster preparedness is a series of activities aimed at anticipating disasters and influencing community responses when they occur, while also reducing the risk of psychological, physical, and material impacts. Knowledge and attitudes toward disaster risk have been shown to significantly influence family preparedness in the face of flooding, as found in research.

Efforts to improve family preparedness cannot be separated from the role of structured, evidence-based education and learning. Disaster mitigation education has proven effective in improving community preparedness, as evidenced which showed a significant difference in disaster preparedness levels before and after disaster mitigation education was implemented ($p = 0.000$) [5]. Furthermore, augmented reality-based education showed a 26.11% increase in students' knowledge and preparedness for tidal flooding with an N-Gain test of 76.97%, proving that interactive learning methods are very effective in disaster mitigation education [6].

An appropriate disaster mitigation learning model is key to the success of preparedness education. in her research on disaster mitigation learning models in junior high schools found that an integrated learning model with cooperative learning and problem-solving methods was the most

effective approach in teaching disaster mitigation, supported by learning media such as films, images, and maps. A study by stated that active community involvement in the mitigation planning process significantly increases program effectiveness. Research by [7] added that disaster mitigation training can help reduce the risk of economic loss by providing practical skills such as creating evacuation routes and managing temporary shelters

RESEARCH METHODOLOGY

This study used a quasi-experimental design, using a one-group pretest-posttest design. This study was conducted by administering a pretest before administering the intervention, followed by the intervention, and finally, a posttest. Therefore, this type of research is classified as a quasi-experimental study

RESULTS

Table 1. Increased family preparedness for flood disasters before and after being given disaster risk mitigation education (n=60)

Variables	f	%
Preparedness Pre-test		
Enough	24	30
Good	36	70
Post test		
Enough	18	10
Good	42	90

Table 2. Analysis of the application of disaster risk mitigation education to increase family preparedness for flood disasters (n=60)

	Negative rank	*Positive rank*	*Ties*	*Mean rank*	*Z score*	*P-values*
Preparedness						
Before				0.00		
	0	7	26		2,336	0.013
After				3.25		

Based on the results of table 1.1 in the pre-test measurement (before the intervention), the majority of respondents, namely 36 people (70%), were in the Good preparedness category, while the remaining 24 people (30%) were still in the Sufficient category. This indicates that although the majority of families already have basic knowledge about flood disasters, there are still some respondents who do not have optimal preparedness.

After being administered an intervention in the form of a disaster risk mitigation education learning model, post-test results showed a significant improvement. The number of respondents in the Good category increased to 42 (90%), while those still in the Fair category decreased drastically to 18 (10%). There was a 20 percentage point increase in the Good category and an equivalent decrease in the Fair category. This improvement indicates that the implementation of the disaster risk mitigation education learning model is effective in increasing family flood preparedness in the Kemayoran area. This finding aligns with previous research showing that structured disaster mitigation education can significantly change community preparedness knowledge, attitudes, and behavior [5].

Based on Table 2.1 above, the results of the Wilcoxon Signed Rank Test obtained a negative rank value of 0 respondents, indicating that no respondents experienced a decrease in their level of preparedness after being given a disaster risk mitigation education intervention. Meanwhile, there were 7 respondents with a positive rank, meaning that there were 7 respondents who experienced an increase in their preparedness scores after the intervention was given. In addition, there were 26 respondents with ties, indicating that their

preparedness scores before and after the intervention did not change.

The mean rank value of 3.25 indicates an average increase in scores among respondents who experienced changes for the better. The analysis results also show a Z value of -2.336 with a p-value of 0.013. Since the p-value is smaller than $\alpha = 0.05$ ($0.013 < 0.05$), it can be concluded that there is a significant difference between the level of family preparedness before and after being given the disaster risk mitigation education learning model.

DISCUSSION

Family Preparedness Level Before Intervention (Pre-test)

The pre-test results showed that of the 60 respondents, 36 (70%) were in the Good preparedness category, while 24 (30%) were in the Fair category. This data indicates that although most families in the Kemayoran area have basic knowledge about flooding, a third of the respondents still lack optimal preparedness in facing the threat of flooding. This situation is understandable, given that the Kemayoran area is a densely populated area that has historically been repeatedly affected by flooding. However, structured educational efforts regarding disaster mitigation have not fully reached all family levels. This is in line with research [8] which confirms that low community preparedness in densely populated settlements is a major factor in the significant losses caused by flooding. Repeated flood experiences can naturally foster preparedness in some families, but without systematic education, this knowledge is often partial and does not encompass all phases of disaster management [8].

Family Preparedness Level After Intervention (Post-test)

After the intervention, a disaster risk mitigation education learning model, was implemented, post-test results showed a significant improvement. The number of respondents in the Good category increased to 42 (90%), while those in the Fair category decreased to just 18 (10%). This 20 percentage point increase in the Good category reflects the success of the learning model in improving families' capacity to understand and prepare for flood disasters.
This improvement demonstrates that structured, needs-based mitigation education can significantly change preparedness knowledge, attitudes, and behavior. These findings align with research which found a significant difference in the level of preparedness before and after the implementation of disaster mitigation education. The remaining 10% of respondents in the Sufficient category after the intervention could be caused by various factors, including limited cognitive ability to absorb the material thoroughly, socio-economic conditions that limit the ability to prepare preparedness facilities, or the duration of the intervention that is not long enough to produce comprehensive behavioral changes in all respondents.

The Influence of the Mitigation Education Learning Model on Family Preparedness

The results of the Wilcoxon Signed Rank Test show a Z value of -2.336 with a p-value of 0.013 ($p < \alpha = 0.05$), which means that H_0 is rejected and H_1 is accepted. Thus, there is a statistically significant effect of the implementation of the disaster risk mitigation education learning model on increasing family preparedness in facing flood disasters in the Kemayoran area [9].

The results of the rank distribution analysis reinforce these findings. The absence of negative ranks (negative rank = 0) proves that none of the respondents experienced a decline in preparedness after the intervention. A total of 7 respondents recorded an increase in their scores with a mean rank of 3.25, while 26 respondents maintained their scores from before the intervention (ties = 26). The high number of ties does not indicate a weakness of the intervention, but rather reflects that most

respondents had achieved a good level of preparedness since the pre-test and managed to maintain it, which is also an indicator of the program's success.

The significance of these results can be explained through several mechanisms. First, the applied learning model integrates cognitive components, such as knowledge about flood risks, affective components, such as fostering a sense of alertness and disaster response, and psychomotor components, such as practical skills such as evacuation, first aid, and preparing emergency bags. This holistic approach has proven more effective than one-way information delivery. Emphasized that an integrated learning model with cooperative learning and problem-solving methods is the most effective approach in disaster mitigation education.

Second, the contextual relevance of the materials provided contributed to the intervention's success. Families in the Kemayoran area have direct experience with flooding, making the educational materials easily relatable to their real-life experiences. As emphasized, active participant engagement in the learning process significantly increases the effectiveness of disaster mitigation programs.

Third, the results of this study align with Yatnikasari's findings which state that knowledge and attitudes toward disaster risk significantly influence family preparedness for flooding. Through the applied learning model, both aspects were successfully improved simultaneously within a single, structured program.

Overall, this study demonstrates that the implementation of a disaster risk mitigation education learning model is an effective and safe intervention, as demonstrated by the absence of a decrease in preparedness among any respondents in improving family preparedness for flooding in the Kemayoran area. These findings provide a strong empirical basis for the development and replication of similar programs in other flood-prone areas, particularly in densely populated urban areas like Jakarta.

CONCLUSION

Based on the results of research on the application of the disaster risk mitigation education learning model to improve family preparedness for flood disasters in the Kemayoran area, it can be concluded that the level of family preparedness before the intervention was mostly in the good category, but there were still families whose preparedness was in the sufficient category and therefore needed improvement through structured education. After being given the intervention in the form of a disaster risk mitigation education learning model, there was an increase in the level of family preparedness as indicated by an increase in the number of respondents in the good category and a decrease in the number of respondents in the sufficient category. This indicates that disaster risk mitigation education is able to improve family knowledge, attitudes, and skills in facing the threat of flood disasters.

The Wilcoxon Signed Rank Test results showed a p-value of 0.013 ($p < 0.05$), which means there is a significant influence between the implementation of the disaster risk mitigation education learning model and the increase in family preparedness. The absence of respondents who experienced a decrease in their level of preparedness after the intervention and the presence of respondents who experienced an increase in their preparedness scores further strengthens the effectiveness of the program provided. Thus, the disaster risk mitigation education learning model has proven effective in increasing family preparedness for flood disasters in the Kemayoran area. This education program can be recommended as a family and community-based disaster risk reduction strategy, especially in urban areas with high flood vulnerability.

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