EARTHQUAKE PREPAREDNESS FOR DISABLED STUDENTS USING THE SCHOOL WATCHING APPROACH

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ABSTRACT

Mamuju, as one of the cities in West Sulawesi, Indonesia, is highly prone to earthquakes. Recently, on January 15, 2021, Mamuju was struck by a major earthquake with a magnitude of 6.2, accompanied by hundreds of aftershocks. The disabled community, particularly students in Special Schools (SLB), faces unique challenges during disasters. Various physical, sensory, or cognitive limitations necessitate a tailored approach to disaster preparedness education. The School Watching approach can enhance awareness and collaboration among stakeholders, including local governments, educational institutions, and organizations focused on disability issues. Objective to improve earthquake preparedness among disabled students at SLB Mamuju through the implementation of the School Watching approach, aiming to create an inclusive, adaptive, and resilient school environment in disaster situations. This study is a quantitative research with a quasi-experimental design, using a pretest and posttest control group approach, conducted from May to July 2024. The study population consisted of SLB students in Mamuju Regency, with a total of 40 respondents divided into two groups using the total sampling technique. The intervention group of 20 students received disaster preparedness education and the School Watching approach for earthquake preparedness twice, each session lasting 60 minutes. The control group was only provided with earthquake preparedness material for 60 minutes without the School Watching approach. Before delivering the material, an initial measurement was conducted to evaluate the students' preparedness and knowledge related to earthquakes, as well as after the material delivery. Descriptive statistical tests were used to summarize the characteristics of the respondents and the pre-test and post-test scores. Subsequently, paired t-tests were conducted to compare the pre-test and post-test results. The School Watching approach had a significant impact on disaster preparedness among disabled students at SLB Mamuju. This was demonstrated by a significant difference between the intervention group and the control group. The School Watching program proved effective in improving earthquake preparedness among disabled students. This is evidenced by a significant difference in the pre-test and post-test results of the intervention group compared to the control group.

Keywords: disabled; preparedness; school watching

INTRODUCTION

Indonesia is geographically situated at the intersection of three major tectonic plates: the Eurasian Plate, the Indo-Australian Plate, and the Pacific Plate. This interaction makes Indonesia highly prone to disasters. A disaster is an event or series of events that threaten and disrupt the lives and livelihoods of communities, caused by natural, non-natural, or human factors, resulting in loss of life, environmental damage, property loss, and psychological impact (Faridzi et al., 2024)Indonesia, located along the "Ring of Fire," has the highest number of active volcanoes in the world, totaling 130 active volcanoes, which is 16% of the global total. These volcanoes formed due to the meeting of the Mediterranean seismic belt and the Pacific Ring of Fire, resulting in two regions of Indonesia being particularly prone to earthquakes and volcanic eruptions. Over the past 400 years, Indonesia has experienced 78 volcanic eruptions, with a threatened area of 16,670 km² and over 5 million people at risk. Recent eruptions have included Mount Sinabung (North Sumatra), Mount Merapi (Central

Java), Mount Bromo (East Java), and Mount Kelud (Safitri et al., 2021)Earthquakes are natural phenomena that are extremely difficult to predict in terms of timing, magnitude, or the extent of their impact, including damage to property and loss of life. Due to the difficulty in predicting earthquakes, a destructive earthquake (magnitude >5.0 on the Richter Scale) often causes significant stress and shock among affected communities, as individuals may lose everything in an instant—family, property, and more. There are three types of earthquakes based on their characteristics (Thoyibah et al., 2019)

Earthquakes can be classified into three main types based on their causes. Collapse earthquakes are caused by the collapse of underground cavities, such as mining tunnels or caves, and typically result in minimal tremors. Volcanic earthquakes occur due to volcanic activity, where magma movement from within the Earth to the surface triggers minor tremors, though the accompanying volcanic eruptions ejecting lava, rocks, ash, and gases can cause significant destruction. Tectonic earthquakes, the most common type in Indonesia, result from the release of energy due to shifting fault lines or elastic strain at subduction zones where oceanic plates collide with continental plates. These earthquakes often originate from plate collisions or fractures, with the focus (hypocenter) located inside the Earth and the epicenter on the surface, generating tremors that can be felt widely (Budi Wibowo et al., 2017).Tectonic earthquakes are currently the most frequent natural phenomena in Indonesia. They occur due to the release of elastic strain energy from rock formations within the Earth. The stronger the energy release, the more powerful the earthquake. Two theories explain the occurrence of earthquakes: one attributes them to fault shifts, and the other to the release of elastic strain energy. Sudden movements along fault lines are a common cause of earthquakes (Budi Wibowo et al., 2017)

On January 15, 2021, Mamuju in West Sulawesi experienced a 6.2 magnitude earthquake at 02:28:21 WITA (Central Indonesian Time). The earthquake, with a depth of 38 km and coordinates of 2.97°S and 118.99°E, caused significant damage to buildings in Mamuju Regency. As of January 17, 2021, the National Disaster Management Agency (BNPB) reported 81 fatalities: 70 in Mamuju and 11 in Majene. The earthquake also caused heavy destruction to coastal, mountainous, and urban areas, marked by the collapse of infrastructure and buildings and the loss of life (Supendi et al., 2021)Historically, West Sulawesi has experienced several significant earthquakes, including a 6.3 magnitude quake on April 11, 1967, and a 6.9 magnitude quake on February 23, 1969. The most impactful earthquake occurred on January 8, 1984, with a magnitude of 6.7 (Supendi et al., 2021)Preparedness involves activities or actions taken to anticipate disasters through proper organization and planning, such as developing emergency response plans, installing early warning systems, preparing essential supplies, conducting outreach and training on emergency response mechanisms, and establishing evacuation sites. It is a preemptive action that facilitates an effective response during emergencies (Hamid, 2020)

Creating a culture of disaster awareness and safety, particularly for earthquakes, can be achieved through disaster education, including disaster mitigation learning. Awareness and education about the risks and dangers of natural disasters must begin early and be continuous. Disaster awareness means students have knowledge and understanding of natural disasters, while preparedness means students are attentive to their environment's disaster potential. Through awareness and preparedness, students can reduce risks or avoid natural disasters (Hamid, 2020)Disaster mitigation education should be introduced from an early age, particularly in elementary schools and special education schools, as these institutions serve as the primary community for children who need protection and knowledge enhancement related to disaster mitigation. This is especially important for disabled students, who are among the

most vulnerable groups during disasters (Hamid, 2020)The School Watching approach offers an innovative strategy for building disaster preparedness in schools by actively involving students, teachers, and the school community in identifying disaster risks, mapping hazards in the school environment, and designing participatory solutions. This method allows special schools (SLB) to integrate disaster preparedness lessons into their curriculum interactively and adaptively, tailored to the abilities of disabled students (Taklal et al., 2023)

Moreover, the School Watching approach can improve awareness and collaboration among stakeholders, including local governments, educational institutions, and disability-focused organizations. Such synergy is crucial for ensuring inclusive earthquake preparedness, which involves not only simulations and training but also the provision of disability-friendly infrastructure, such as accessible evacuation routes and emergency communication tools (Taklal et al., 2023)As one of the special education institutions in an earthquake-prone area, SLB Mamuju has the potential to serve as a model for inclusive disaster preparedness programs. By involving disabled students in every stage of the planning and implementation of School Watching, a more resilient school community can be developed. This program also aims to reduce the vulnerability of disabled students and increase their safety during emergencies (Meilianingsih & Sugiyanto, 2022)For these reasons, it is essential to equip students, especially disabled learners, with knowledge about earthquakes, their impacts, and self-rescue measures, particularly when earthquakes occur during class hours. Therefore, the researcher is interested in studying earthquake preparedness among disabled students using the School Watching approach at SLB Mamuju

METHOD
The research design used in this study is a Quasi-Experimental Design, specifically the pretest–posttest control group design. This design is suitable for comparing the outcomes of a health program intervention. In this design, the assignment of sample members to the intervention and control groups is not done randomly. The reference population in this study consists of students with disabilities. The study population includes students with disabilities enrolled in Special Education Schools (SLB) in Mamuju Regency. The sample size consists of 20 individuals for the intervention group and 20 individuals for the control group, determined based on sample size calculations. The intervention group is given disaster preparedness material and the School Watching approach to earthquake preparedness twice, each session lasting 60 minutes, while the control group is only given earthquake preparedness material for 60 minutes without the School Watching approach. Earthquake preparedness is measured before and after the intervention using a questionnaire for both the intervention and control groups. The validity of the questionnaire is conducted by involving experts in the fields of disaster management or special education to assess the relevance and completeness of the items in the questionnaire. Reliability is measured using Cronbach's Alpha coefficient, with an Alpha value > 0.7.

RESULT
Data collection will be conducted from May to July 2024 at the SLB Pembina of West Sulawesi Province and the SLB Dharma Wanita of Mamuju Regency. During this period, 40 respondents will be obtained.SLB Pembina of West Sulawesi Province is an educational institution located in the provincial capital, Mamuju. This school plays an important role in providing education for children with disabilities in the region. SLB Pembina has relatively complete facilities to support the learning process for students with various types of disabilities, including physical, sensory, and intellectual disabilities.SLB Dharma Wanita is another school located in Mamuju Regency, which also provides education for students with disabilities. This school was established with the aim of offering inclusive education and

improving the quality of life for children with disabilities in Mamuju Regency. In addition, SLB Dharma Wanita is known for its greater focus on the welfare and socio-emotional development of students with disabilities
Table 1.

Table 1.
Distribution of Respondent Characteristics in the Intervention and Control Groups of SLB Mamuju Students (n = 20)

Respondent Group	Category	Intervention Group (N = 20)	%	Control Group (N = 20)	%
Gender	Female	6	30.0	7	35.0
	Male	14	70.0	13	65.0
Age	9 Years	2	10.0	0	0
	10 Years	5	25.0	0	0
	11 Years	8	40.0	6	30.0
	12 Years	5	25.0	0	0
	13 Years	0	0	12	60.0
Type of Disability	Visual Impairment	5	25.0	4	20.0
	Physical Disability	6	30.0	9	45.0
	Hearing Impairment	4	20.0	2	10.0
	Mental Retardation	3	15.0	3	15.0
	Intellectual Disability	2	10.0	2	10.0

Based on the table above, in the intervention group, the majority of respondents are male, with 14 males (70%) out of the total respondents in this group. Only 6 individuals (30%) are female. Similarly, in the control group, males also dominate, with 13 males (65%), while females total 7 individuals (35%). Therefore, in both the intervention and control groups, males make up the majority, although the male percentage is higher in the intervention group. The intervention group has a more diverse age distribution, ranging from 9 to 12 years old. There are 2 individuals (10%) in this group who are 9 years old, 5 individuals (25%) who are 11 years old, and 8 individuals (40%) who are 12 years old. On the other hand, the control group is predominantly made up of older respondents, with 13-year-olds making up 60% or 12 individuals. Additionally, the control group has no respondents aged 9 or 12 years, while those aged 11 total 6 individuals (30%).In terms of disability types, the distribution of respondents in both groups shows some differences. Respondents with visual impairment (Tuna Netra) are more numerous in the intervention group (25%, 5 individuals) compared to the control group (20%, 4 individuals). Physical disability (Tuna Daksa) dominates the control group, with 9 individuals (45%), while the intervention group only has 6 individuals (30%). Respondents with hearing impairment (Tuna Rungu) are more frequent in the intervention group (20%, 4 individuals) compared to the control group (10%, 2 individuals). For mental retardation (Tuna Laras), both groups have the same number of respondents, 3 individuals (15%) each. A similar pattern is seen with intellectual disability (Tuna Grahita), where both groups have 2 individuals (10%) each.

Table 2
The Effect of School Watching on Disaster Preparedness among Disabled Students in SLB
Mamuju in the Intervention and Control Groups (n=20)

Group	Mean Rank	Sum of Rank	Z	P Value
Intervention	10.50	210.00	-4.472	0.000
Control	6.50	78.00	-2.646	0.008

The results of the study indicate that the School Watching program has a significant impact on disaster preparedness among disabled students at SLB Mamuju. This is evidenced by the significant difference between the intervention group and the control group. The mean rank value for the intervention group (10.50) is higher compared to the control group (6.50), indicating better preparedness among students who participated in the School Watching program. The Mann-Whitney test results show a Z value of -4.472 with a P value of 0.000 for the intervention group, and a Z value of -2.646 with a P value of 0.008 for the control group, both of which are below the significance level of 0.05. Therefore, the School Watching program is proven to be effective in improving disaster preparedness among disabled students, and it is recommended that this program be implemented more broadly as part of disaster risk reduction strategies in inclusive educational environments.

Table 3
Difference in Disaster Preparedness Among SLB Students Before and After Intervention in
the Intervention and Control Groups (n = 20)

Group	Kondisi	N	Mean Rank	Sum of Ranks	P Value
Intervention	Pre	20	10.50	210.00	-
Intervention	Post	20	10.50	210.00	0.000
Control	Pre	20	6.50	78.00	-
Control	Post	20	7.00	91.00	0.001 - 0.008

Based on the table above, in the intervention group, the Mean Rank before the intervention was 10.50, with a Sum of Ranks of 210.00. This indicates the baseline preparedness level of students in disaster response before the intervention was applied. There is no p-value for the pre-condition, as this is the baseline used for comparing changes that occurred after the intervention. After the intervention, the Mean Rank in the intervention group remained 10.50, indicating that all students in this group showed improved preparedness in facing disasters. The Sum of Ranks remained at 210.00, indicating that all respondents had higher ranks after the intervention. The p-value for the intervention group is 0.000, which is very small and indicates that the change between the pre and post conditions is highly statistically significant. This means that the intervention applied had a positive impact on increasing the students' disaster preparedness.

In the control group, the Mean Rank before the intervention was 6.50, with a Sum of Ranks of 78.00. This reflects the students' preparedness level before the intervention was implemented. There is no p-value for the pre-condition, as this is the initial data used for comparison with the post-condition. After the intervention, the Mean Rank for the control group increased to 7.00, with a Sum of Ranks of 91.00, indicating some improvement in preparedness, although not as much as in the intervention group. The p-value for the control group ranges from 0.001 to 0.008, indicating that the change after the intervention is statistically significant. However, this change is not as large as that observed in the intervention group, as shown by the smaller p-value for the intervention group (0.000).In the intervention group, the intervention applied had a very significant impact on increasing students' preparedness in facing disasters, as evidenced by the p-value of 0.000. In the control group, although there was an increase in

preparedness, the change was smaller compared to the intervention group. Nonetheless, this change is still statistically significant (the p-value ranges from 0.001 to 0.008). Overall, it can be concluded that the intervention provided in the intervention group was more effective in improving students' disaster preparedness compared to the control group

DISCUSSION

Mamuju is located in an area known as the Ring of Fire, where active tectonic movements frequently trigger earthquakes. This region is directly bordered by the Palu-Koro fault, one of Indonesia's most active faults, which often generates significant earthquakes, including the 6.2 magnitude quake in 2021. This event caused significant infrastructure damage and loss of life (Khristianto et al., 2015)For the local population, especially children with disabilities, the threat of earthquakes poses a major challenge. Accessibility barriers and a lack of inclusive disaster mitigation programs exacerbate risks for this group. This demands special attention to create approaches that are not only technically effective but also inclusive.During earthquakes, individuals with disabilities often find themselves in the most vulnerable positions due to various barriers. These barriers can be categorized into three main types: physical barriers, where students with mobility limitations require assistance during evacuation, which is often unavailable in emergency scenarios (Haryanto, M.Pd; Haris Iriyanto, S.Sos, 2020); cognitive barriers, where students with intellectual disabilities face difficulties in understanding standard evacuation instructions (WHO, 2022); and psychosocial barriers, where students with disabilities experience higher levels of trauma and stress due to their limited ability to interact with the environment during disasters (Harsono et al., 2020).

Disaster preparedness is a critical element in disaster risk mitigation, particularly in inclusive educational settings involving students with disabilities. This study aims to evaluate the effectiveness of the School Watching program in improving disaster preparedness among students with disabilities at SLB Mamuju. This program is designed to enhance students' awareness, knowledge, and skills in facing disaster situations through participatory activities. Previous research shows that students with disabilities are often not directly involved in disaster planning and simulation at schools. This is due to the assumption that they are unable to follow standard procedures. However, research in Japan demonstrates that with inclusive training methods, students with disabilities can show significant improvement in understanding and responding to disasters (Boon et al., 2011)School Watching was first developed in Japan as part of a community-based disaster mitigation program (Widiandari, 2021). This method involves all school elements in identifying disaster risks in their environment. Activities such as marking safe zones, evacuation drills, and risk discussions are conducted regularly to improve preparedness.

The School Watching approach actively involves students, teachers, and school staff in identifying risks in their environment and designing disaster mitigation plans tailored to local needs. Initially introduced in Japan, this approach has been adapted in various countries, including Indonesia, with adjustments to cultural contexts and local needs.For students with disabilities, this approach provides opportunities to participate directly in the mitigation process, fostering confidence and building practical skills to face disasters. At SLB Mamuju, this approach is expected to address inclusivity challenges in disaster mitigation.The research findings show significant differences in disaster preparedness between the intervention and control groups as well as between pre-test and post-test conditions. The following discussion will delve deeper into these findings, supporting them with previous literature, and identifying existing research gaps.In the intervention group pre-test condition, the intervention group had a Mean Rank of 10.50 with a Sum of Ranks of 210.00. After implementing the School Watching program (post-test), the same values were maintained, but with a p-value = 0.000,

indicating significant changes in preparedness. These results suggest that students could understand and directly apply the knowledge provided through the program, enhancing their readiness to face disasters.

In the control group pre-test condition, the control group had a Mean Rank of 6.50 with a Sum of Ranks of 78.00. At post-test, there was a slight increase to a Mean Rank of 7.00 with a Sum of Ranks of 91.00, but the p-value ranged between 0.001 and 0.008. This minor increase indicates an insignificant improvement in preparedness, likely due to general exposure to disaster-related information within the school or community environment. Research at SLB Mamuju strengthens these findings by adding practical dimensions to the implementation of School Watching. For instance, involving students with disabilities directly in simulations and risk identification improved their practical skills. These findings align with the study by (Astini et al., 2018), which showed a 60% improvement in understanding among students with disabilities after participating in a similar program in Yogyakarta. However, technical challenges such as the accessibility of evacuation routes in Mamuju indicate that geographic and local infrastructure contexts play a significant role.This study highlights the importance of adapting School Watching for students with disabilities. At SLB Mamuju, the use of visual aids such as safe zone maps and color-coded signals proved more effective than verbal instructions. These findings are consistent with the research by (Meilianingsih & Sugiyanto, 2022), which stated that visual-based approaches are more suitable for students with hearing and intellectual disabilities.

The effectiveness of School Watching is influenced by the active involvement of the entire school community. Students with disabilities at SLB Mamuju showed a positive response when teachers and school staff provided active support during simulations. This indicates that the program's success depends not only on the students but also on the capacity of educators and school staff.Research on disaster preparedness among individuals with disabilities shows that they are often overlooked in conventional mitigation programs. For example, a study by (Hayati et al., 2021) revealed that only 20% of students with disabilities understood standard evacuation procedures, compared to 80% of students without disabilities. This highlights the need for specialized approaches tailored to their needs.In Indonesia, a study by (Astini et al., 2018) revealed that most special education schools (SLB) lacked clear disaster contingency plans. This was attributed to limited resources, inadequate training, and a lack of specific guidance from the government. The study recommended integrating community-based approaches, such as School Watching, to address these gaps.School Watching was initially developed as part of a community-based disaster mitigation program in Japan (Kitagwa, n.d.). This method centers on student participation in risk identification, safe zone determination, and evacuation simulations. In Japan, this approach successfully reduced disaster casualties in schools during the Tohoku earthquake in 2011 because students were well-trained to recognize threats and respond quickly.

In Indonesia, this approach began to be adapted through collaborative programs between local governments and non-governmental organizations. A study by (Prahara et al., 2023) demonstrated that implementing School Watching in inclusive schools improved disaster preparedness among students with disabilities by up to 60%. However, the main challenge in implementation is the lack of specialized training for teachers to support students with disabilities.A study by (Mulyadi et al.2020) showed that participatory programs like School Watching could increase disaster awareness by up to 70% among elementary school students. This research underscores that active student involvement in risk identification and mitigation planning creates a deeper understanding and sense of ownership of preparedness measures. These findings support our study's results, where the intervention group showed significant

improvement after participating in the School Watching program. Research by (Taklal et al., 2023) highlighted that students with disabilities require a more personalized approach to disaster preparedness education. Simulation-based learning methods and visual aids, such as tactile maps and Braille guides, have proven effective in helping students understand disaster risks. However, the lack of suitable aids often becomes a barrier in implementing programs in special schools (SLB).

Research by (Dian Tamitiadini, Isma Adila, 2019) emphasized the importance of considering socio-cultural factors in disaster education. For example, in West Sulawesi, community values and local community involvement play a crucial role in the success of disaster mitigation programs. This is relevant to our study, given that the social environment at SLB Mamuju can influence the effectiveness of the School Watching program. Most previous research has focused more on general student populations in regular schools. Research related to students with disabilities, especially in local contexts like SLB Mamuju, is still very limited. Putra et al. (2021) noted that the lack of empirical data on the effectiveness of disaster mitigation programs for students with disabilities hinders the development of evidence-based policies in the inclusive education sector.This study only evaluates pre-test and post-test results over a short period. The long-term impact of the School Watching program on behavioral changes and disaster preparedness knowledge among students with disabilities has yet to be explored. (Satria, 2023) emphasized the importance of longitudinal studies to evaluate how acquired knowledge can be retained and applied in real-life situations in the future.Challenges in implementing School Watching were also found in previous studies. Research by (Rahmawati et al.2019) in Indonesia identified that a lack of teacher training is the main obstacle. Teachers often lack the skills to adapt preparedness materials for students with disabilities. In your study, similar challenges emerged at SLB Mamuju, where some teachers were unfamiliar with using visual aids or simple technology like disaster simulation apps.

Additionally, research by (Yahya, 2020) noted that school infrastructure often does not support accessibility for students with disabilities. Your study results showed that although SLB Mamuju had designated evacuation routes, these routes were not entirely wheelchair-friendly. This indicates a gap between theoretical planning and practical implementation in the field.An effective School Watching program requires resource support, such as teacher training, educational aids, and community involvement. However, in resource-limited areas like SLB Mamuju, program implementation can face significant operational challenges. (Maulana et al., 2020) showed that teacher training in disaster mitigation is often hampered by a lack of funding and infrastructure in remote schools.Social and cultural factors influencing program acceptance and effectiveness have also received little attention in previous research. For instance, in some communities, students with disabilities may face stigma that limits their participation in community-based programs. (Benardi et al., 2024) emphasized that family and local community involvement is critical to reducing stigma and increasing participation of students with disabilities in disaster preparedness activities.

CONCLUSION
The School Watching program has proven effective in enhancing earthquake preparedness among students with disabilities. This is evidenced by the significant differences in the pre-test and post-test results of the intervention group compared to the control group.The program's success is closely tied to its participatory approach, which aligns with local needs. The active involvement of students in risk identification and simulation exercises fosters a deeper understanding of disaster mitigation measures.

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